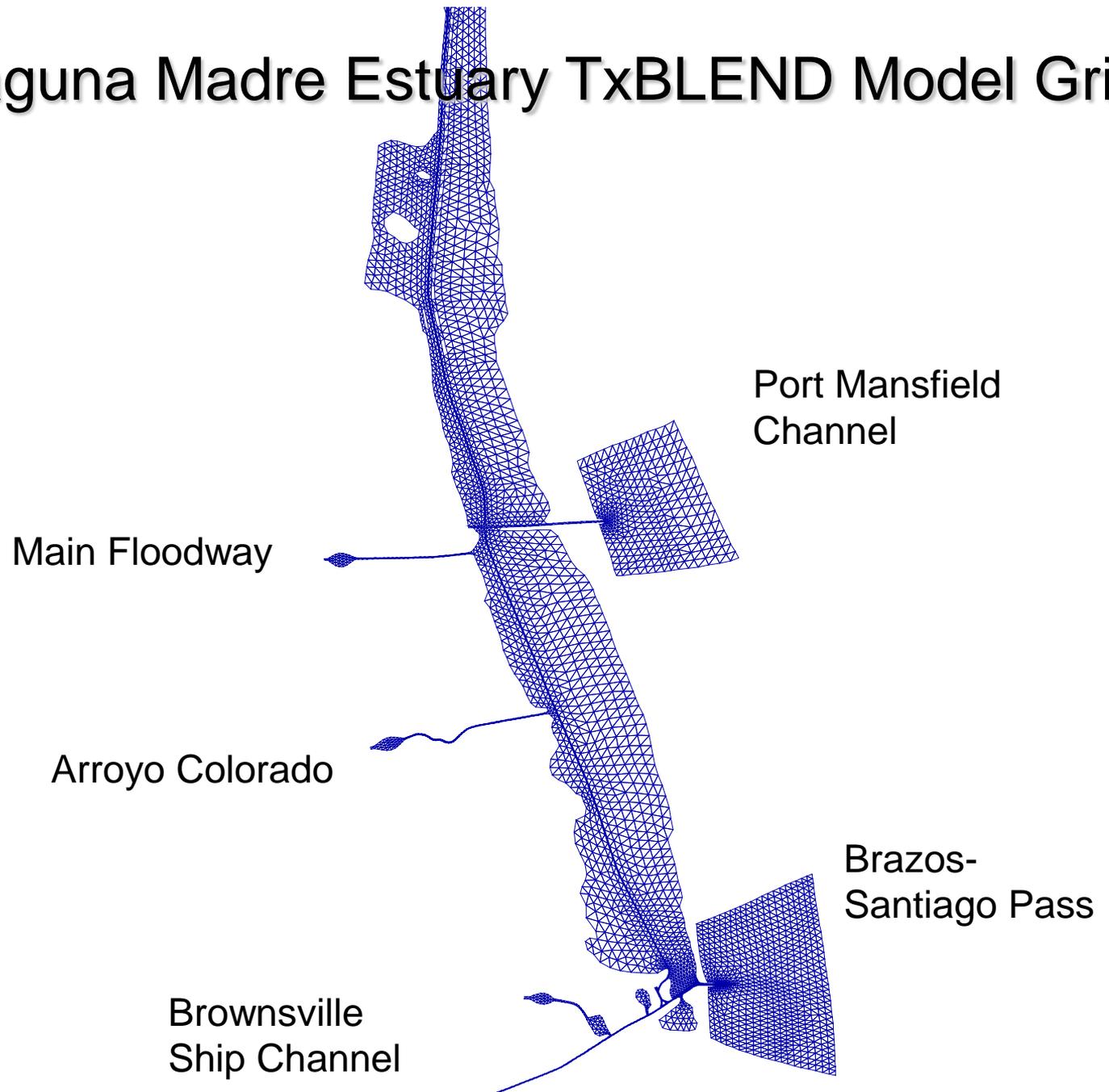


Application of TxBLEND Salinity Contour Maps  
to Delineating Target Seagrass Areas  
Affected by the Arroyo Colorado Plume

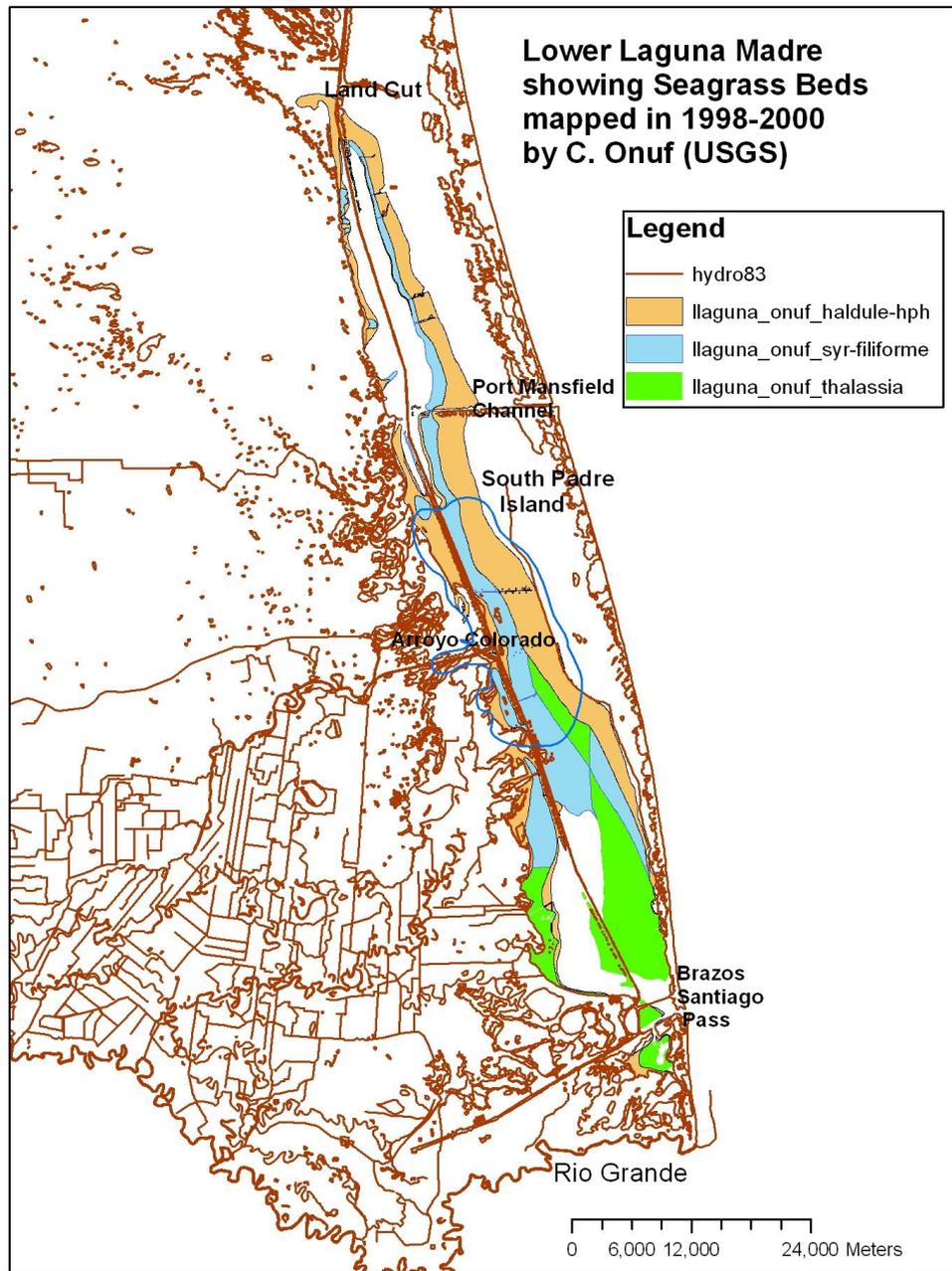
# Lower Laguna Madre Estuary TxBLEND Model Grid



# 2009 NAIP Imagery of Lower Laguna Madre



**Lower Laguna Madre showing Seagrass Beds mapped in 1998-2000 by C. Onuf (USGS)**



**Legend**

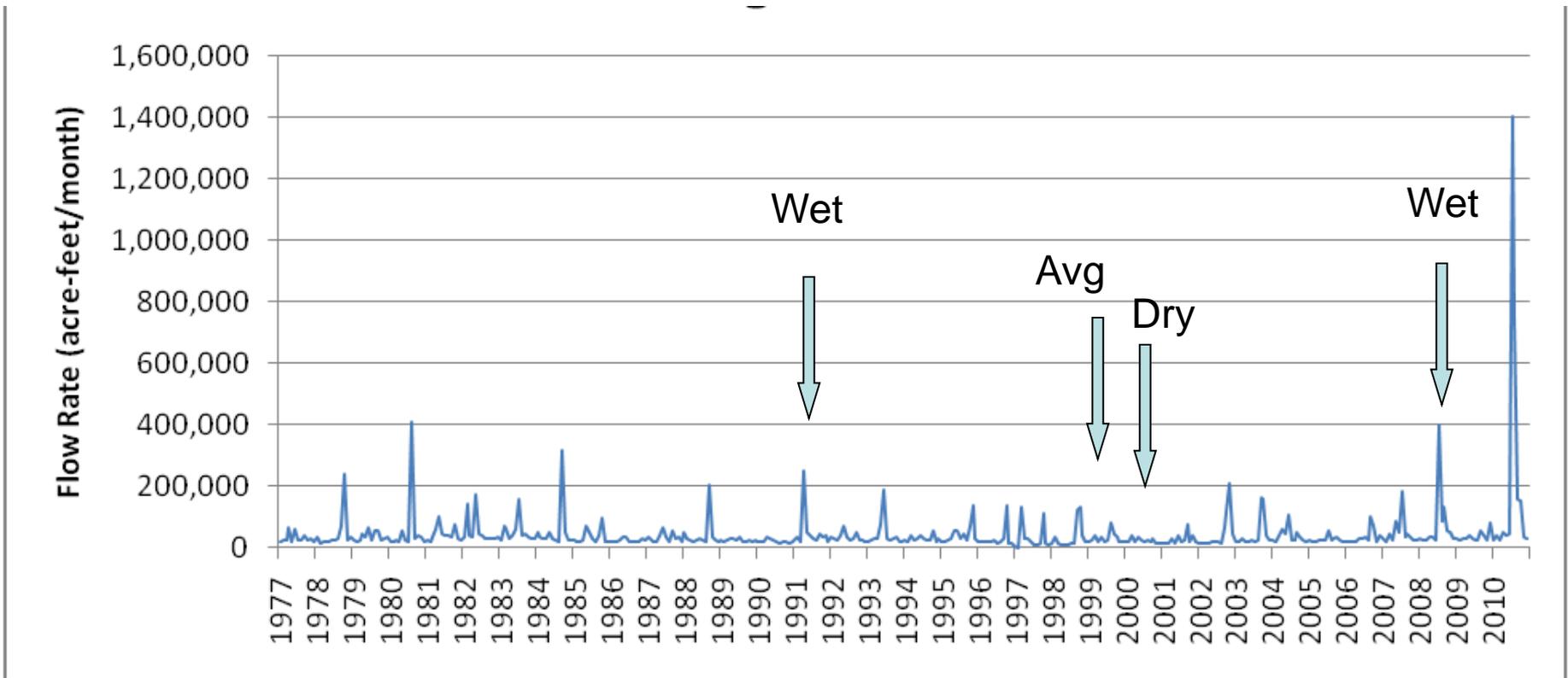
- hydro83
- llaguna\_onuf\_haldule-hph
- llaguna\_onuf\_syr-filiforme
- llaguna\_onuf\_thalassia

0 6,000 12,000 24,000 Meters

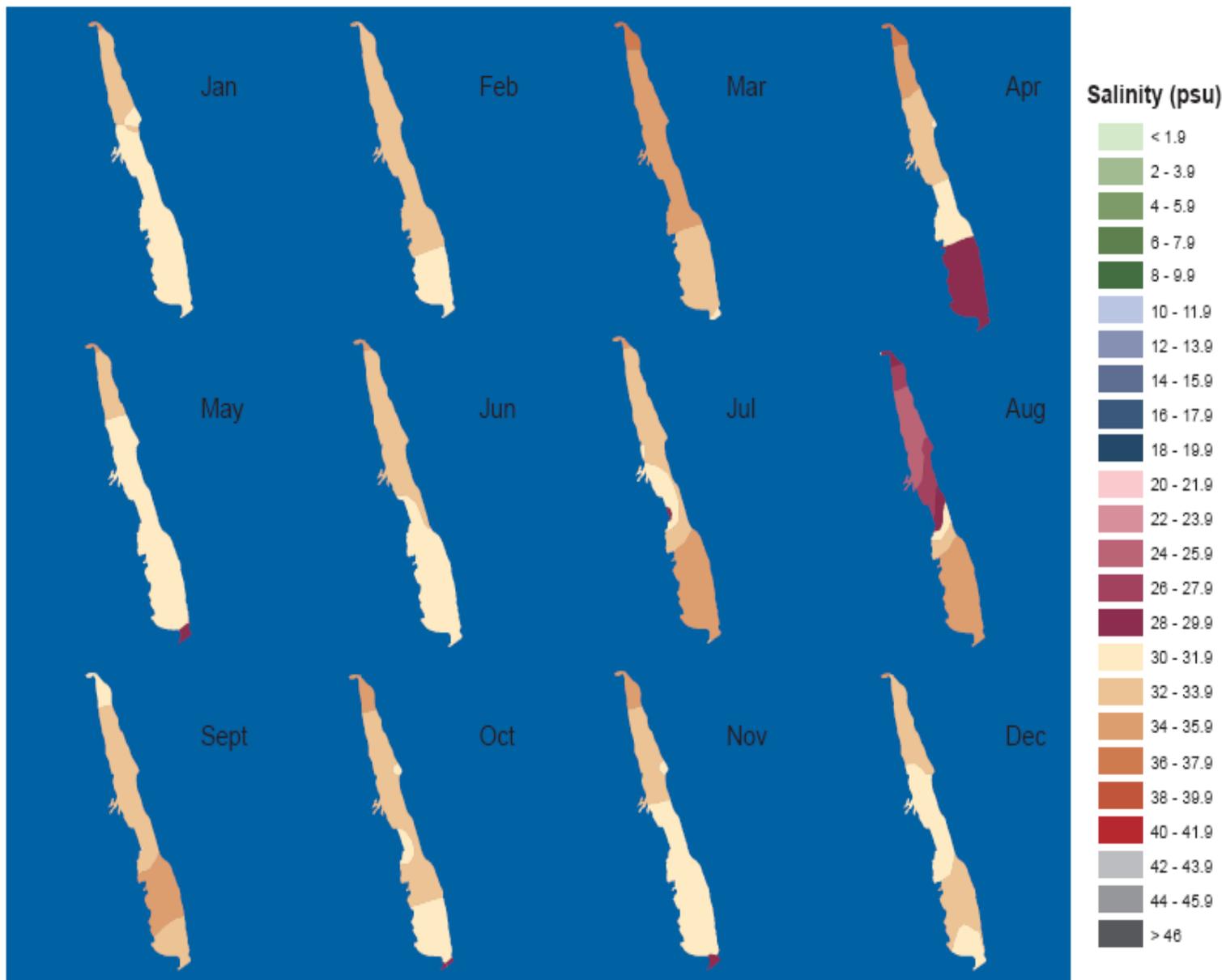


**TxBLEND Grid Overlaid on  
2009 NAIP Imagery of Lower  
Laguna Madre**

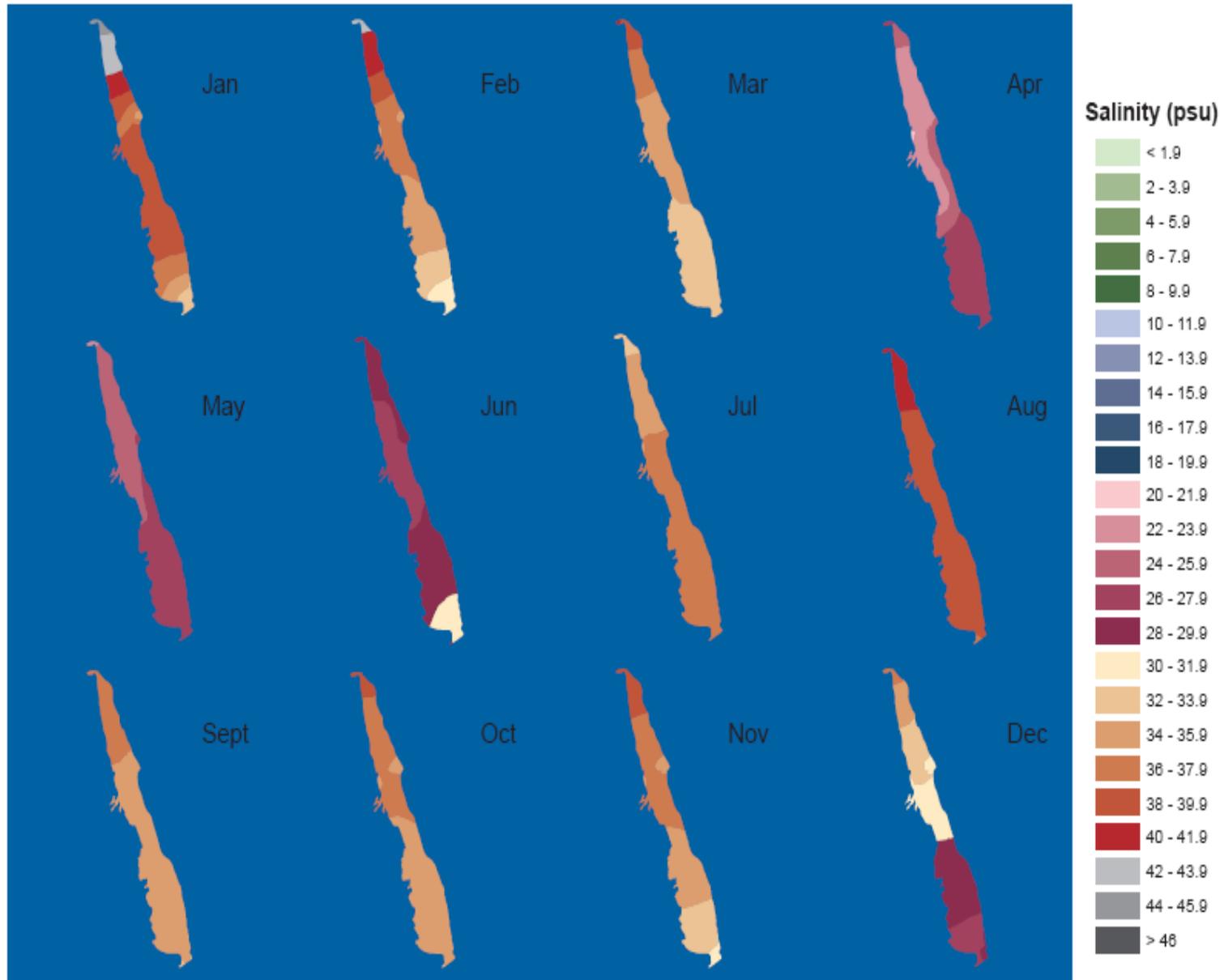
# Monthly Combined Freshwater Inflow to the Lower Laguna Madre



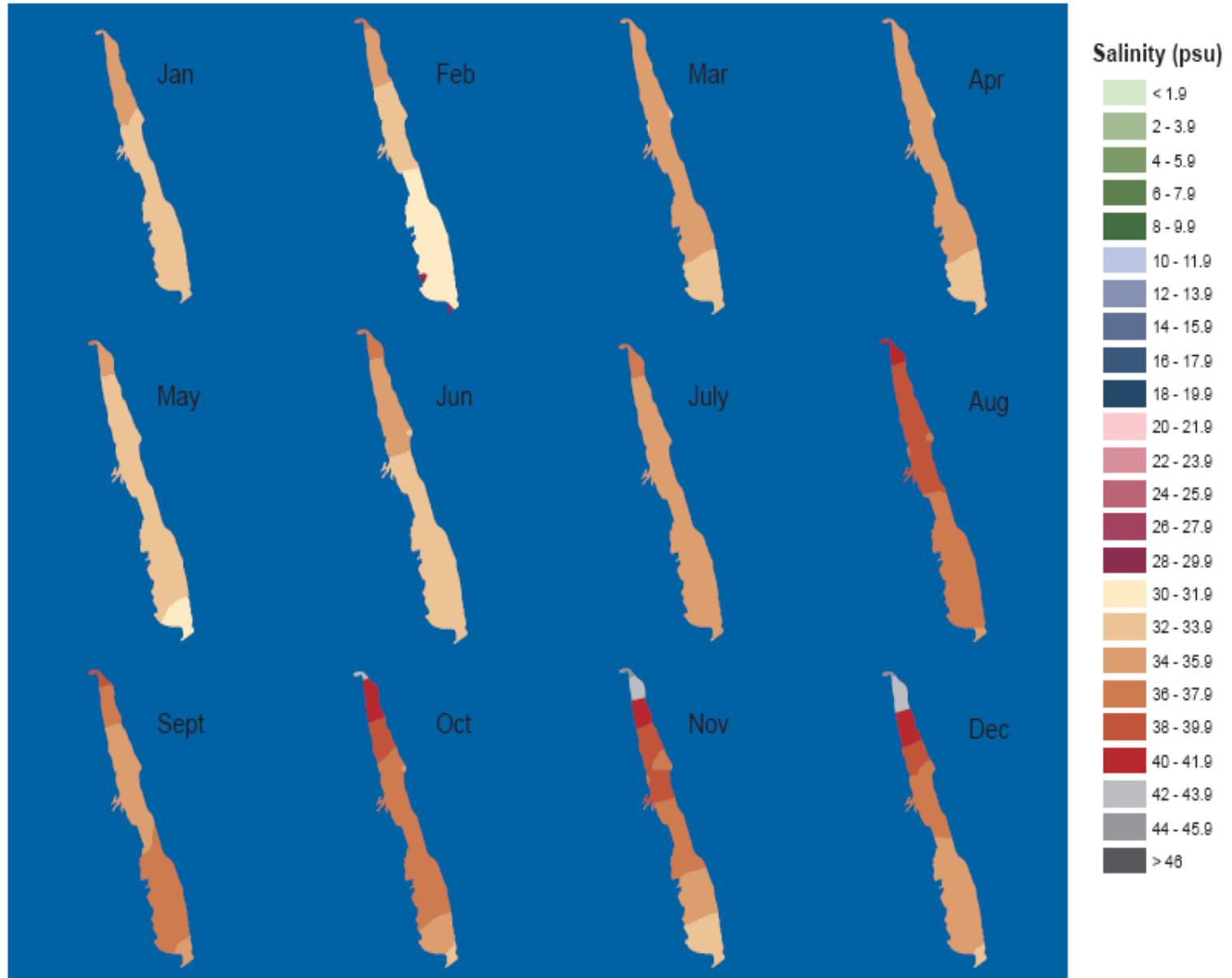
# 2008 - Wet



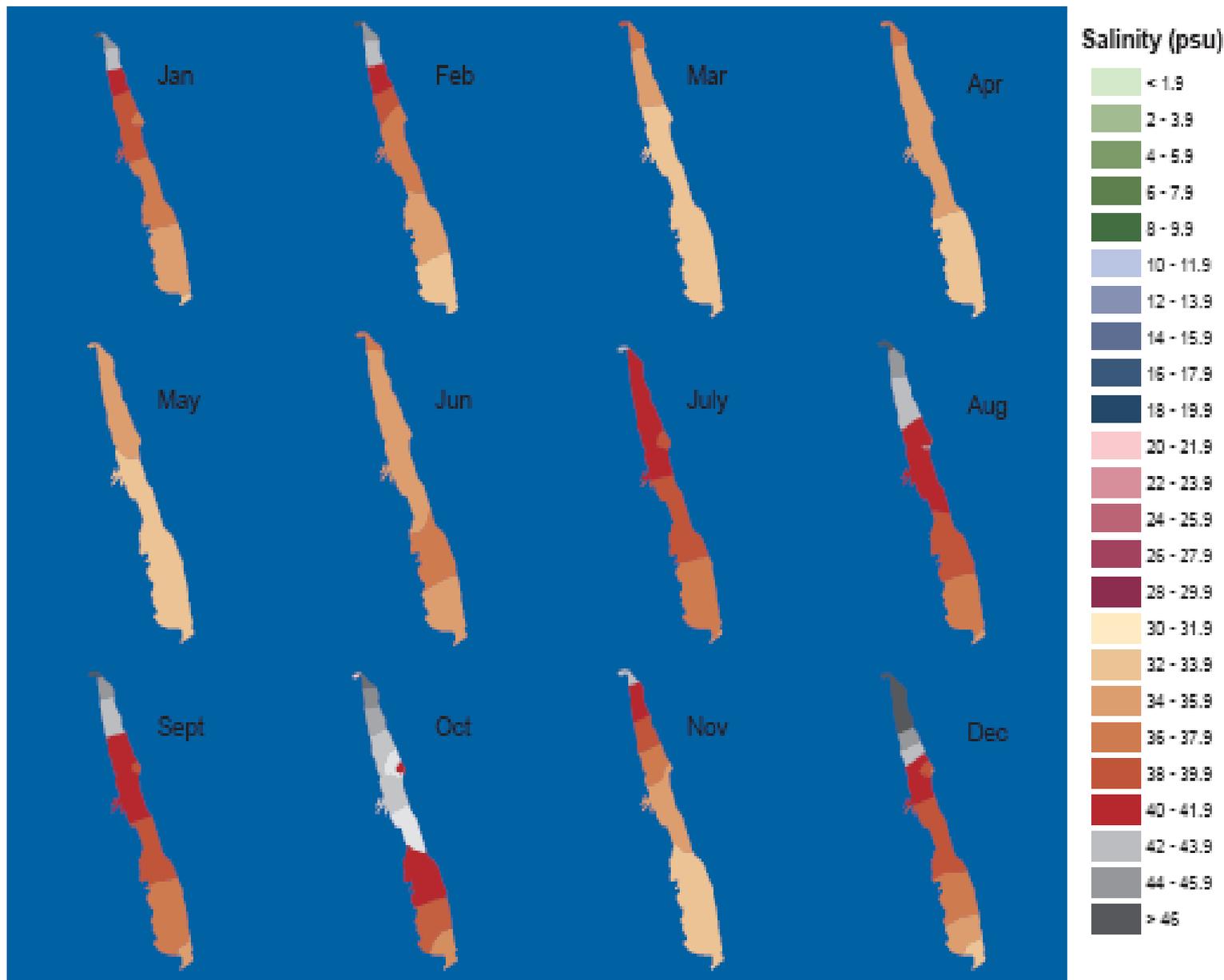
# 1991 - Wet



# 1999 - Average



# 2000 - Dry



1991 TxBLEND Salinity Contours  
for April (left) and May (rt)



1991 TxBLEND Salinity Contours  
for May (left) and June (rt)



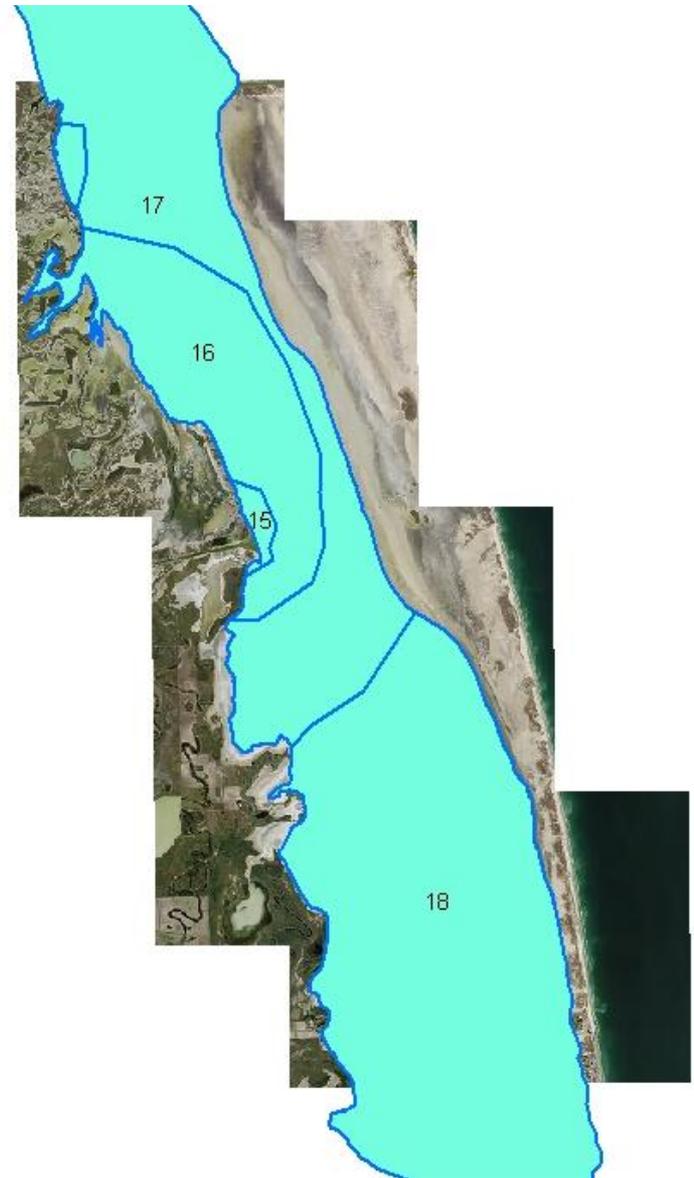
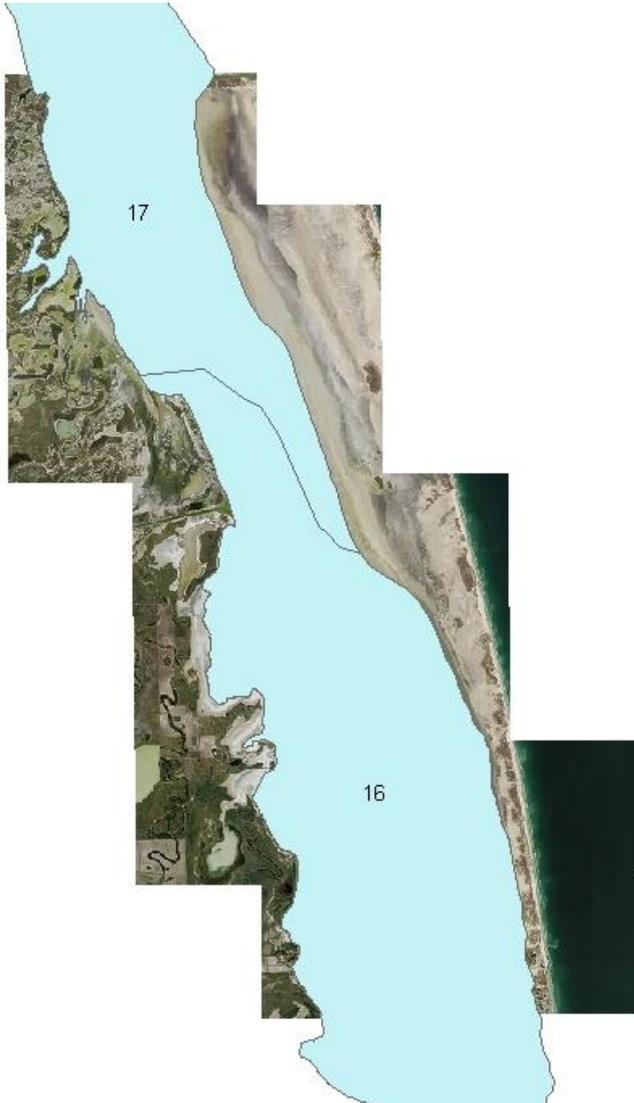
1991 TxBLEND Salinity Contours  
for July (left) and Aug (rt)



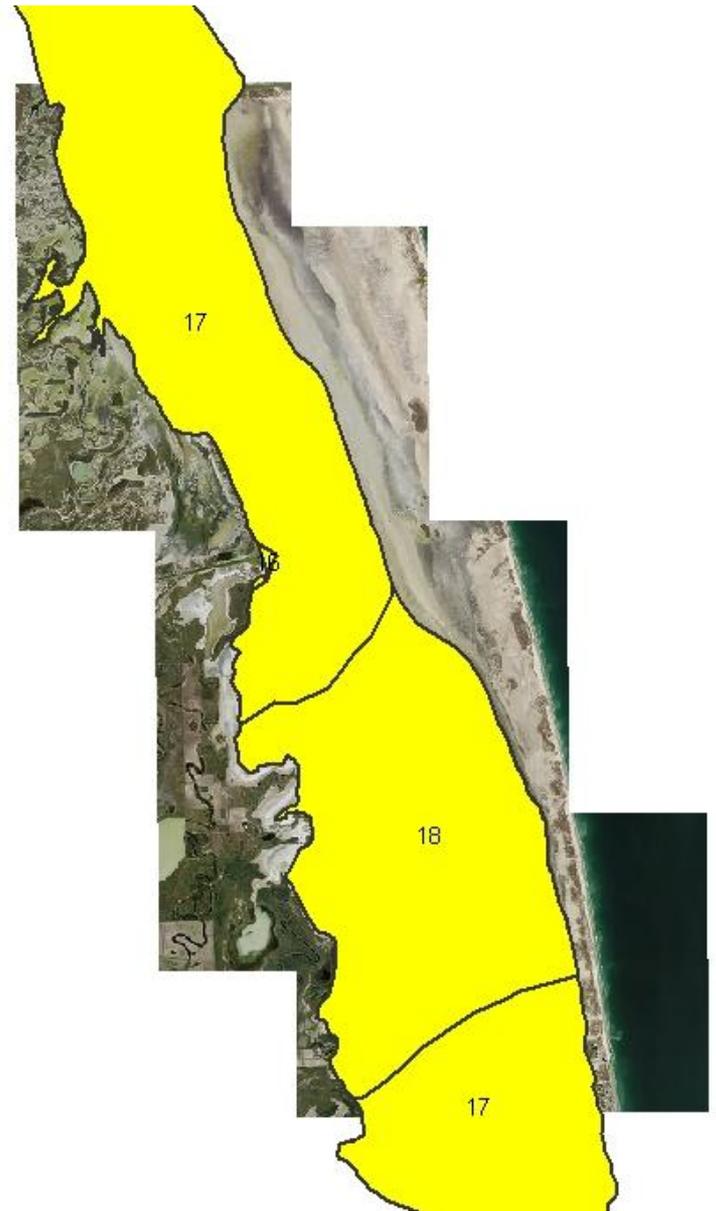
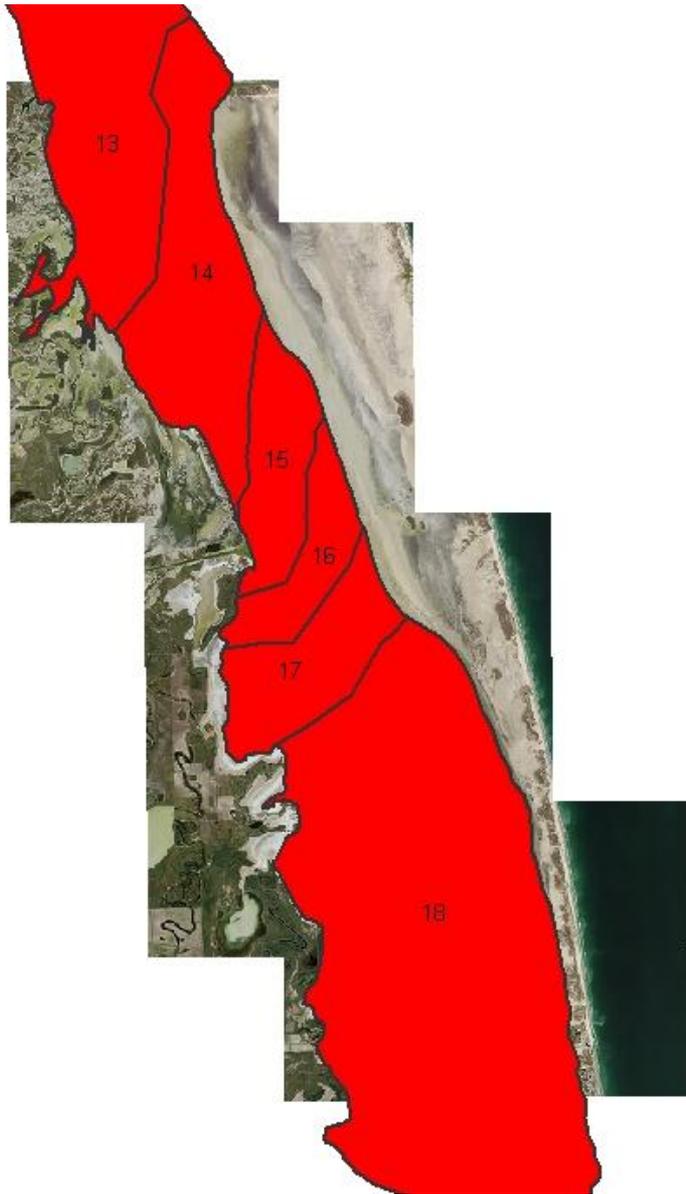
1999 TxBLEND Salinity Contours  
for Aug (left) and Sept (rt)



2008 TxBLEND Salinity Contours  
for June (left) and July (rt)



2008 TxBLEND Salinity Contours  
for Aug (left) and Sept (rt)



2008 TxBLEND Salinity Contours  
for Oct ()



## Summary and Conclusions

1. A.C. “plume” extends northward from A.C. mouth, often up to Pt Mansfield, as seen by 2 psu salinity polygons in 4 selected years.
2. Plume mostly stays on GIWW side of LLM, until it reaches north of Green Is area, then fans out to E.
3. Plume seems to overlay mostly bare areas or sparse seagrass.
3. Plume is most clearly observed during “Wet Yr” months (1991, 2008) when total inflow is 200,000 ac-ft/month. During “Avg Yr” like 1999, plume appears very temporary, 1 month only Sept. Plume not seen in “Dry Yr” 2000.
4. Duration of plume may last over several months when flow in A.C. is extended (3 months in 2008; 3 months in 1999).
5. Questions:
  - What is the distance/area for a significant plume? Does the area of this plume define the target zone of seagrass bed for inflow impacts? What is minimal flow from A.C. that produces this significant plume into LM? And during which seasons?
  - How does this plume information inform our upcoming N isotope field study? What is the best sampling design to detect the postulated N gradient produced by such a plume?

# Summary of Model Performance for Simulated Salinity

| Location              | Data   |           | Days | r <sup>2</sup> | RMS<br>(ppt) | NSEC  | Average Salinity (ppt) |          |            |
|-----------------------|--------|-----------|------|----------------|--------------|-------|------------------------|----------|------------|
|                       | Source | Period    |      |                |              |       | Simulated              | Observed | Difference |
| Old Isabel Causeway   | TPWD   | 1991-1992 | 10   | 0.45           | 2.9          | -0.12 | 30.9                   | 31.0     | -0.1       |
| Old Isabel Causeway   | TWDB   | 1991      | 161  | 0.57           | 3.1          | 0.09  | 30.5                   | 31.3     | -0.8       |
| Arroyo-C Mouth, deep  | TWDB   | 1991      | 262  | 0.40           | 7.7          | 0.09  | 20.8                   | 25.0     | -4.2       |
| Arroyo-C Mouth        | TPWD   | 1991-1992 | 10   | 0.12           | 9.9          | 0.10  | 19.9                   | 19.6     | 0.3        |
| Arroyo-C Mouth, deep  | TWDB   | 1997      | 139  | 0.69           | 5.5          | 0.55  | 27.1                   | 29.8     | -2.7       |
| Arroyo-C Mouth, shllw | TWDB   | 1997      | 139  | 0.62           | 11.8         | -2.98 | 27.1                   | 16.4     | 10.7       |
| Arroyo-C Mouth        | TPWD   | 1995-2002 | 51   | 0.13           | 9.6          | -0.14 | 23.8                   | 20.2     | 3.6        |
| Arroyo-C Mouth        | TPWD   | 2003-2009 | 44   | 0.28           | 8.0          | 0.03  | 22.3                   | 19.4     | 2.9        |
| Port Mansfield        | TWDB   | 1997      | 175  | 0.69           | 5.2          | 0.15  | 36.5                   | 32.4     | 4.1        |
| Port Mansfield        | TPWD   | 1995-2002 | 40   | 0.43           | 7.1          | 0.28  | 34.5                   | 31.3     | 3.2        |
| Port Mansfield        | TPWD   | 2003-2009 | 35   | 0.26           | 6.1          | 0.01  | 34.4                   | 31.3     | 3.1        |
| Bird Island           | TPWD   | 1995-2002 | 77   | 0.39           | 8.0          | -0.32 | 42.6                   | 37.0     | 5.6        |
| Bird Island           | TWDB   | 2003-2005 | 596  | 0.06           | 9.7          | -0.21 | 34.0                   | 32.5     | 1.5        |
| Bird Island           | TPWD   | 2003-2009 | 55   | 0.39           | 6.6          | 0.29  | 38.4                   | 36.5     | 1.9        |
| Stover Point          | TPWD   | 1995-2002 | 43   | 0.12           | 4.2          | -0.16 | 33.4                   | 33.9     | -0.5       |
| Stover Point          | TPWD   | 2003-2009 | 45   | 0.16           | 4.5          | -0.02 | 32.5                   | 34.1     | -1.6       |
| Realitos Peninsula    | CBI    | 2009-2010 | 515  | 0.56           | 4.7          | 0.48  | 29.7                   | 28.0     | 1.7        |
| S Padre Island CG     | CBI    | 2009-2010 | 528  | 0.95           | 0.7          | 0.95  | 29.5                   | 29.4     | 0.1        |