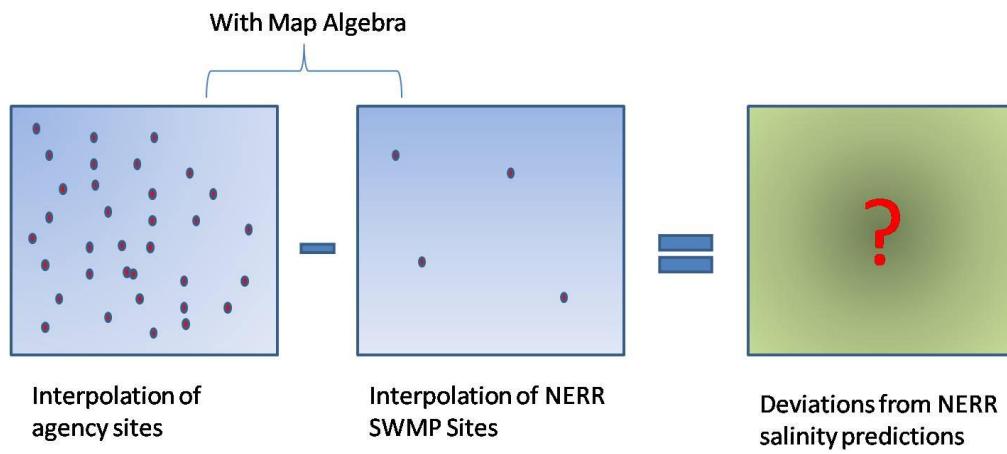


The graph above shows the changes in salinity over time at the five stations in the Mission-Aransas National Estuarine Research Reserve (NERR) that are part of the System Wide Monitoring Program (SWMP). The colors and labels on the graph above correspond to the colors on the map to the right, which show the locations of each of the SWMP stations. Salinity and other water quality measurements are collected every 15 minutes at each of the SWMP stations, offering a data source with high temporal resolution.

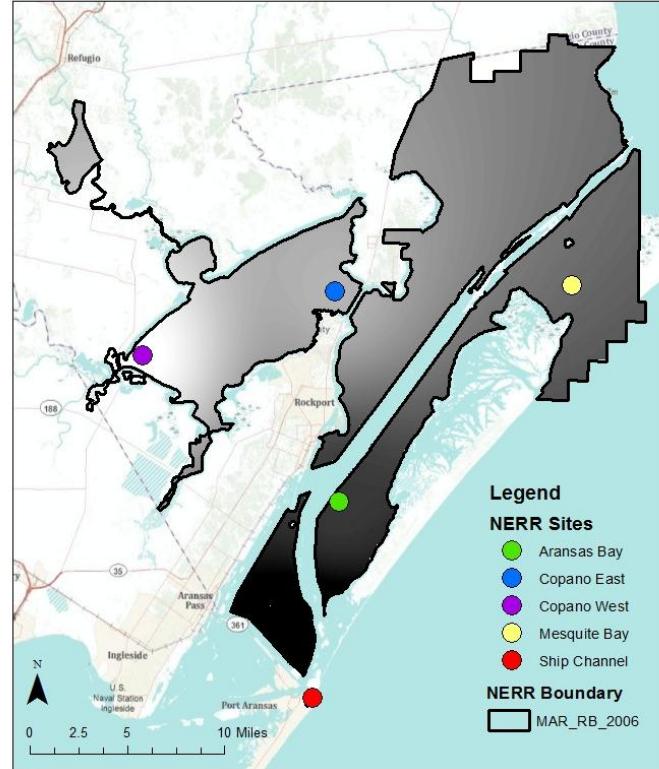
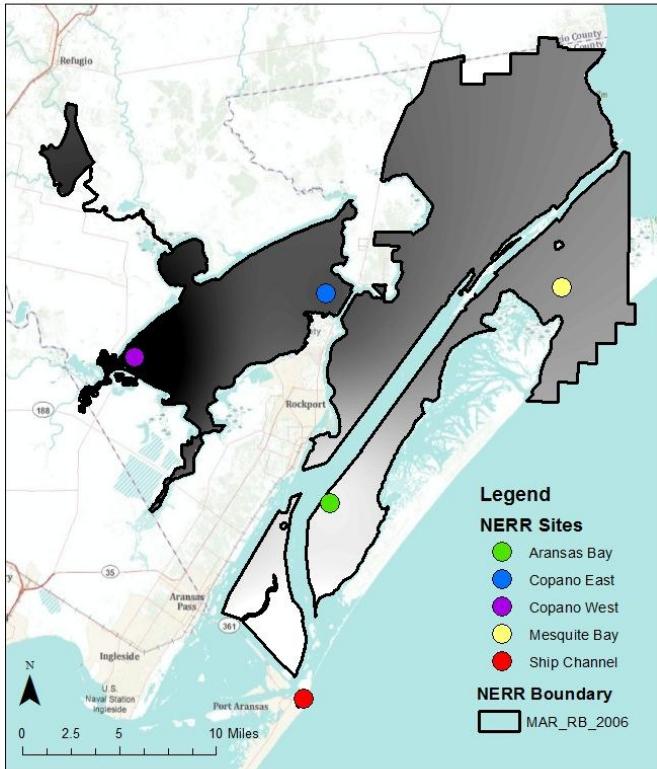
The five SWMP stations capture a salinity gradient ranging from lower salinities near the freshwater inputs of the Mission and Aransas Rivers in Copano Bay to the higher salinities at the Ship Channel site. During wet years such as 2007 and 2010, these gradients are more pronounced, as shown on the salinities graph. However, in drier years such as 2009 and 2011, these differences in salinities appear to converge at higher levels (see attached figures at end). While there are long term trends that last over the course of seasons or years, there are also shorter term fluctuations in salinity that may occur over a few weeks. Salinity within the bays tends to be in response to the freshwater inflows, and thus, precipitation and the flow of the Mission and Aransas Rivers.

Some state agencies also measure salinity within the Mission Aransas NERR. While these measurements are far less frequent than the measurements taken by the SWMP stations of the NERR system, these measurements are taken at more locations within the NERR. Therefore, these data have high spatial resolution, but lower temporal resolution than the NERR data. While I do not have the spatially high resolution data (yet), variability in salinity in the NERR is likely due to differences in bathymetry, mixing regimes, freshwater influx, watershed characteristics and a host of other factors. Predicting salinity at a high spatial resolution using the influencing factors is a daunting task. In my project, I hope to first determine what time scale salinity changes on within the NERR, and then visually demonstrate the variability of salinities in the NERR.

In order to visually demonstrate the variability of salinities within the NERR, I plan to compare interpolations of the high resolution salinity data to an interpolation of the NERR data alone on the same date to produce a “deviation raster” (concept illustrated below). These deviation rasters will show what the difference, either positive or negative, is between interpolations predicted by the low spatial resolution NERR data and the actual salinity data at that point in time. This will highlight areas that may have higher, or lower salinity than one would expect if trying to extrapolate salinity at a location with NERR data alone (such as for a time period when a nearby area was not sampled)



Right now, I'm planning on generating a unique deviation raster for each date (depending on availability of data, and not considering dates before the NERR was established). These rasters can be used (with map algebra) to generate the average deviation from NERR data for each cell, which means that these deviations will be able to show spatial patterns. I will also generate standard deviations for each cell to investigate if there are spatial patterns in the variability of salinity as well. Depending on the dates for which high spatial resolution data is available, I may also investigate if there are differences in the spatial distribution of average deviations from NERR data depending on season, and between wet and dry years.



IDW interpolations of salinity distributions at midnight on September 1st in a dry year (2009) and a wet year (2007). Note that in the wet year, 2007, a stronger salinity gradient is established, as the scale stretches from a salinity of 2.3 to 13 (since this is based on a single measurement, ship channel salinity may be tidally influenced) where the protected waters of Copano Bay are fresher, as indicated by the lighter color. In the dry year, 2009, there is a weaker salinity gradient ranging from 37 to 43, and the higher salinities (indicated by darker colors) are actually found in the protected waters of Copano Bay.