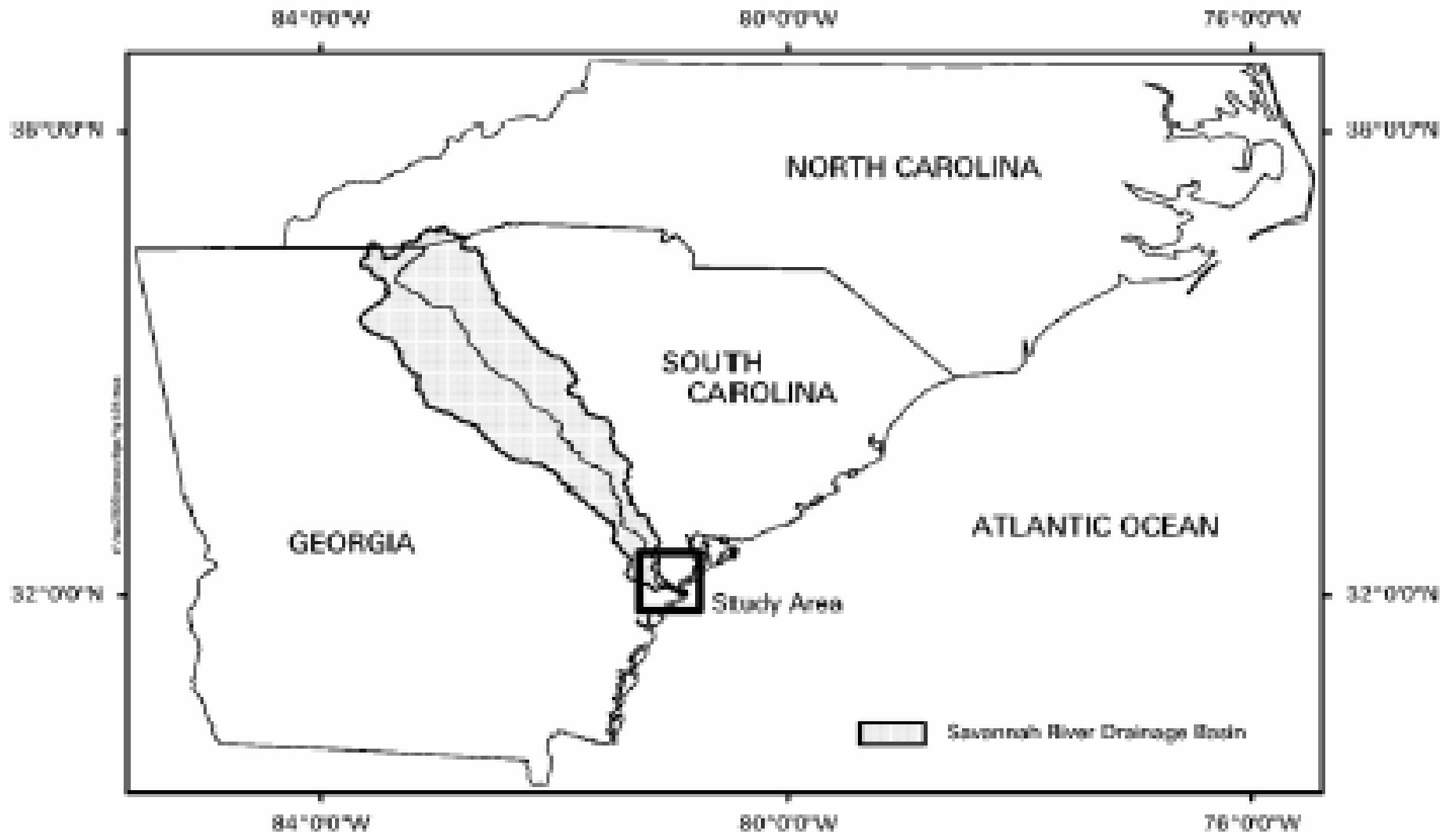




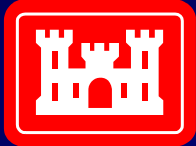
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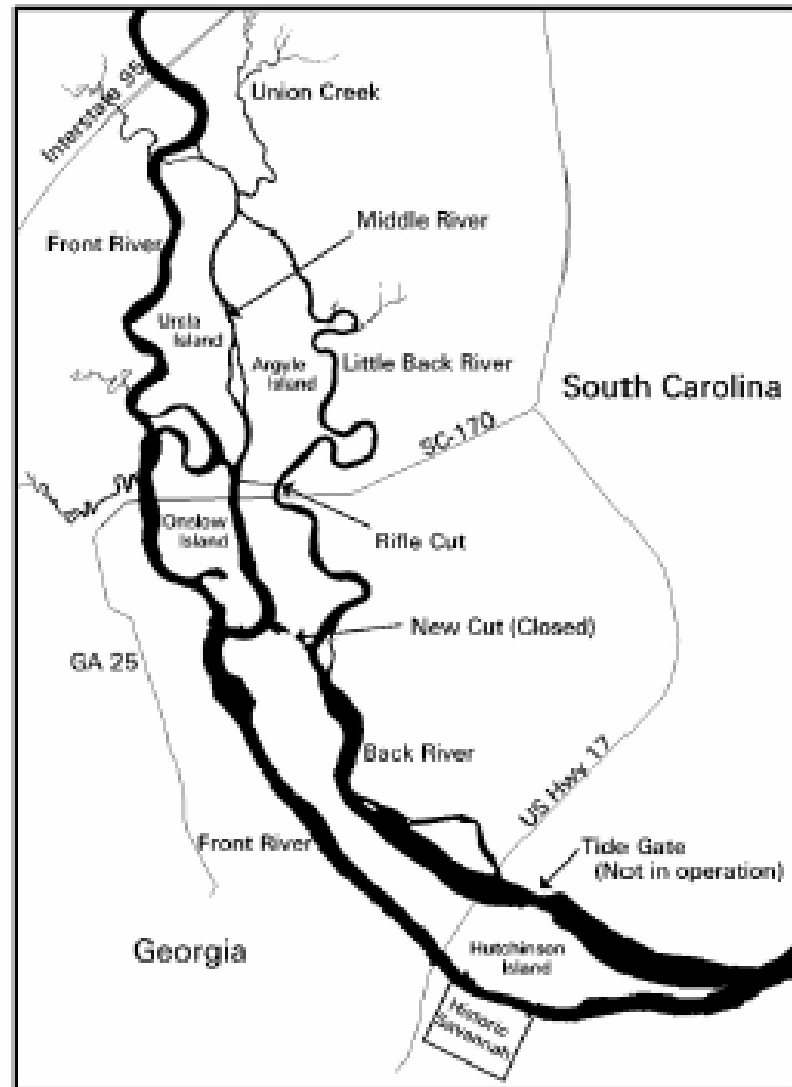
Identifying Impacts to Estuarine Wetlands



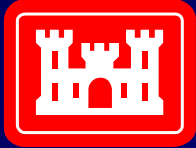
ATM 2003



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ATM 2003

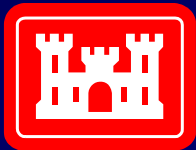


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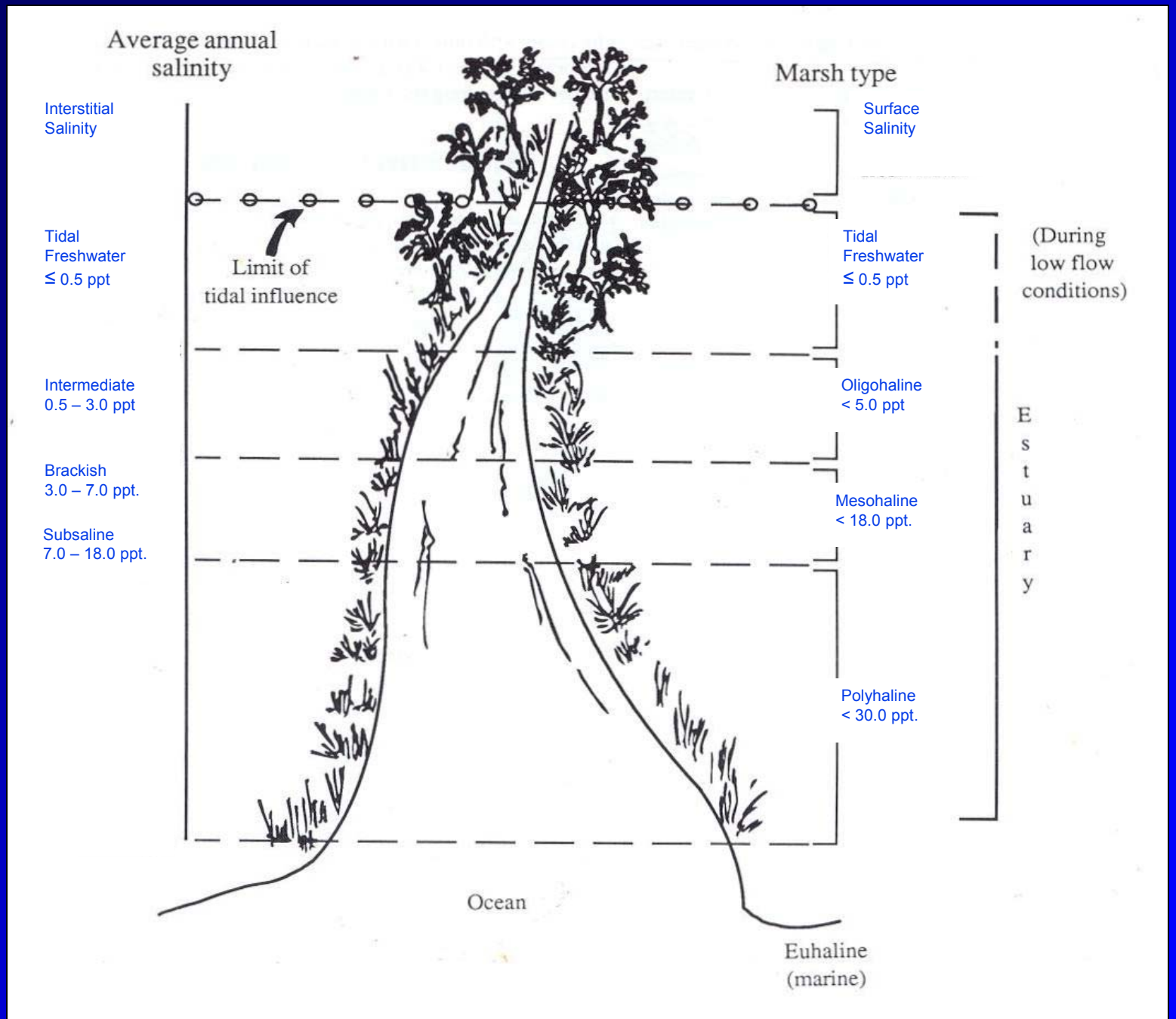
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Why are wetlands an issue?

- **Savannah Harbor is located in an estuary**
 - Estuary = an area where fresh and saltwater mix
- **Deep-draft shipping channel allows saltwater to move further into the estuary**
- **Freshwater-oriented Savannah National Wildlife Refuge is located at the upstream end of the harbor**



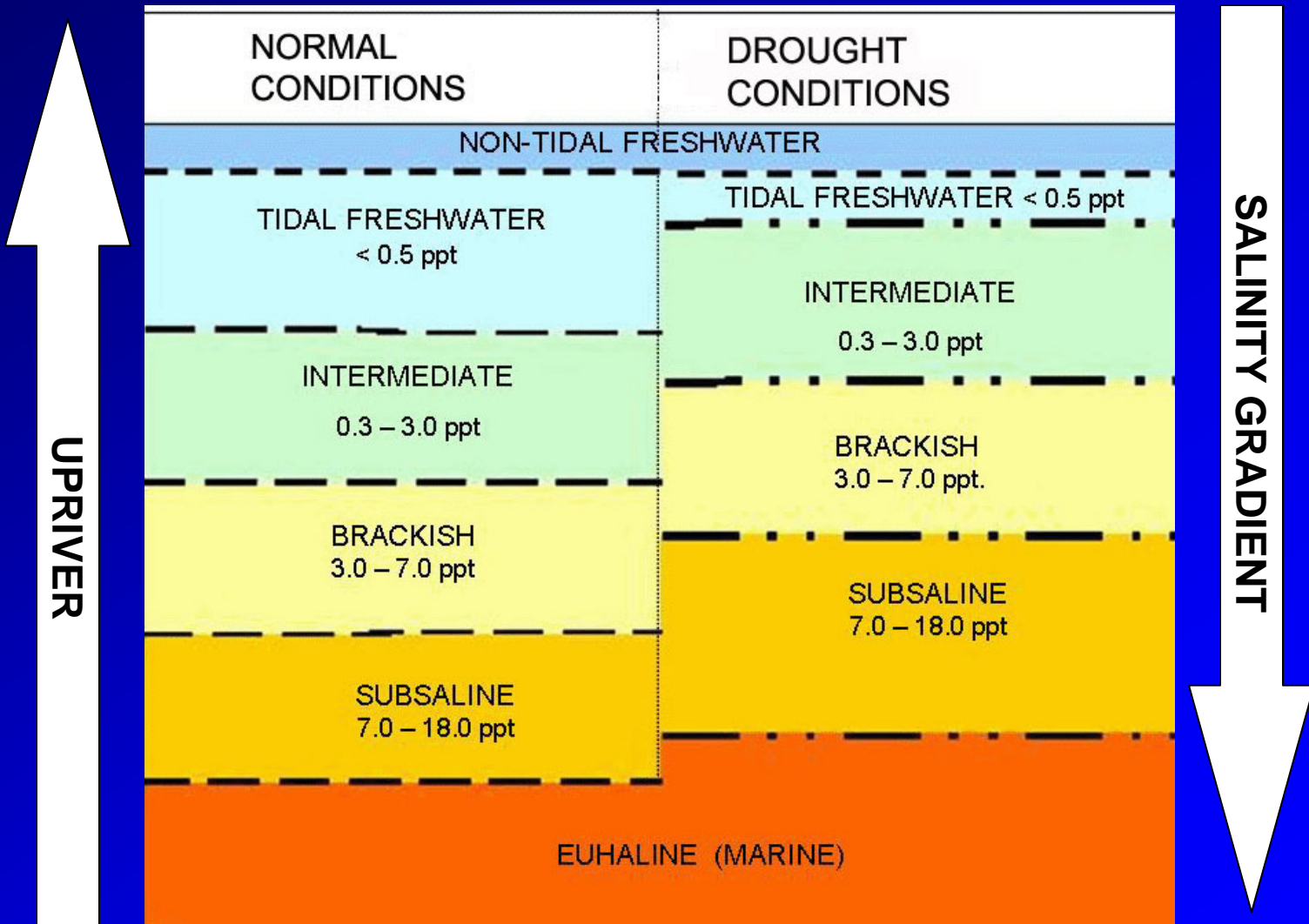
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USGS 2002



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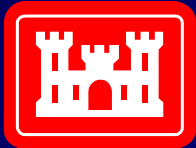
FROM
USGS 2003



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So why is this so hard ?



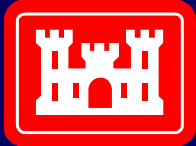
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Infrared Aerial Photograph 1999



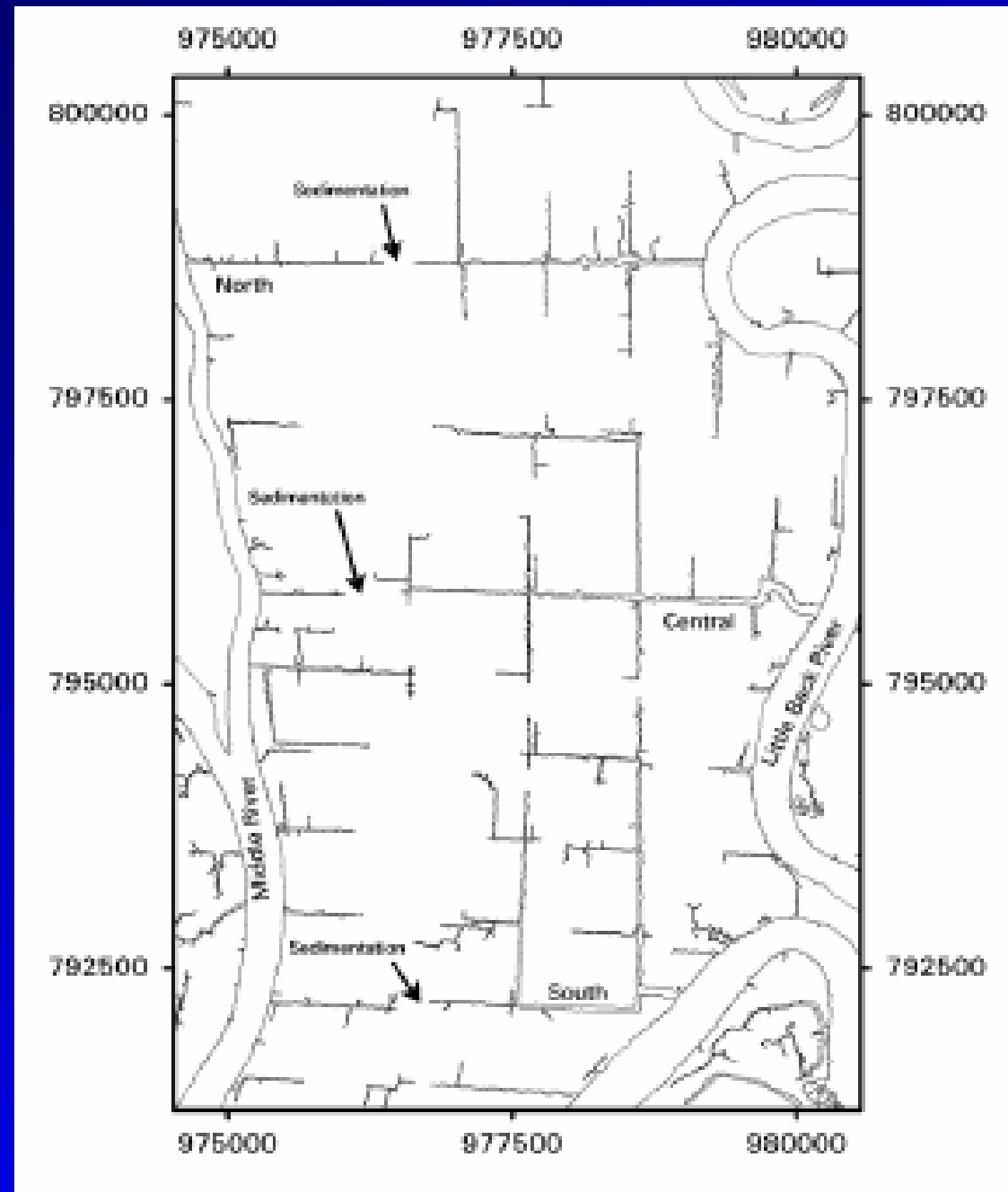
© 1999 The United States Army Corps of Engineers

ATM 2003

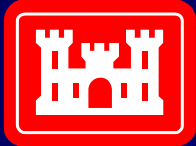


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Complexity of the water distribution networks



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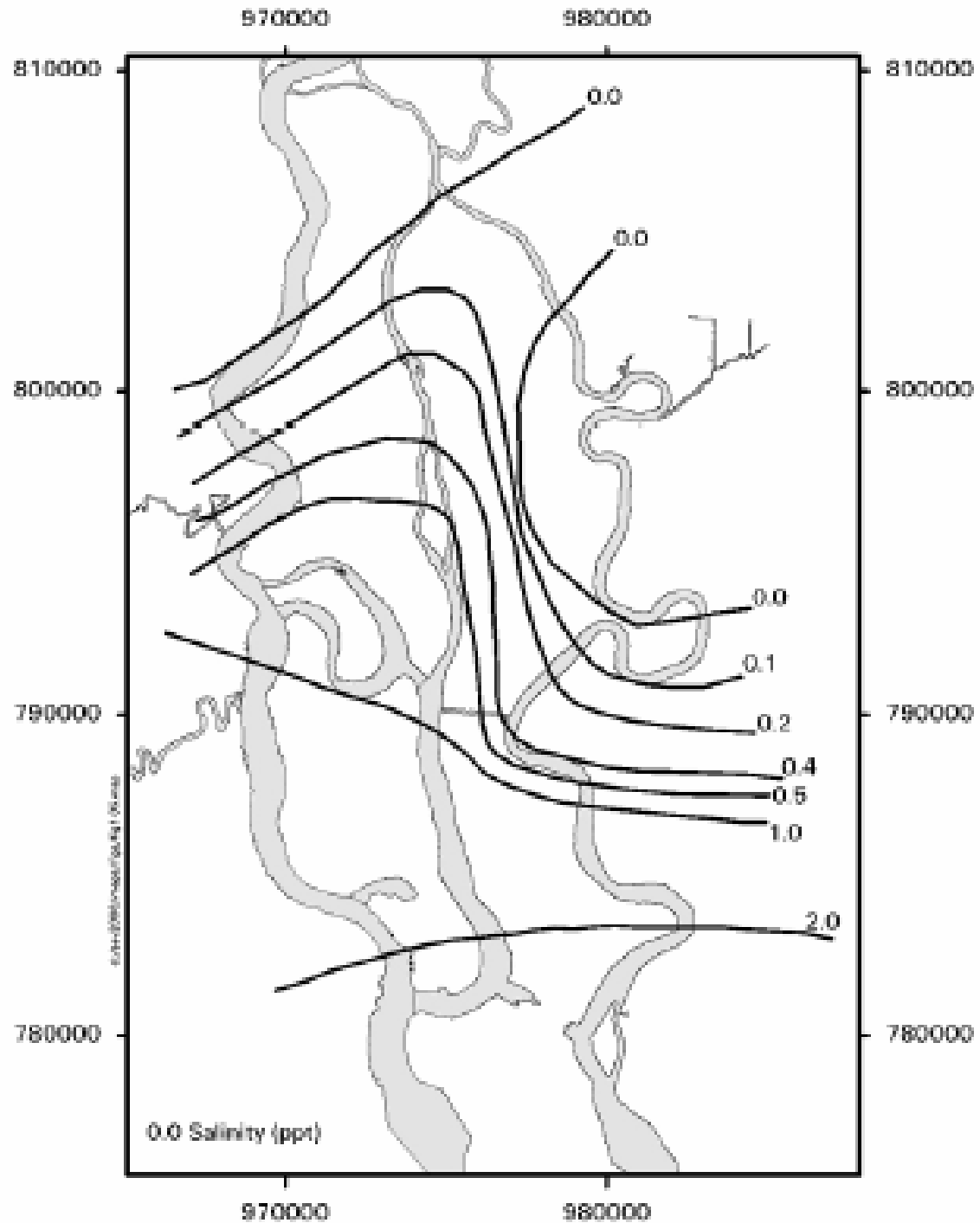


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Salinity Contours

Normal Growing
Season --
8,200 CFS

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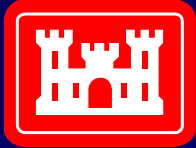




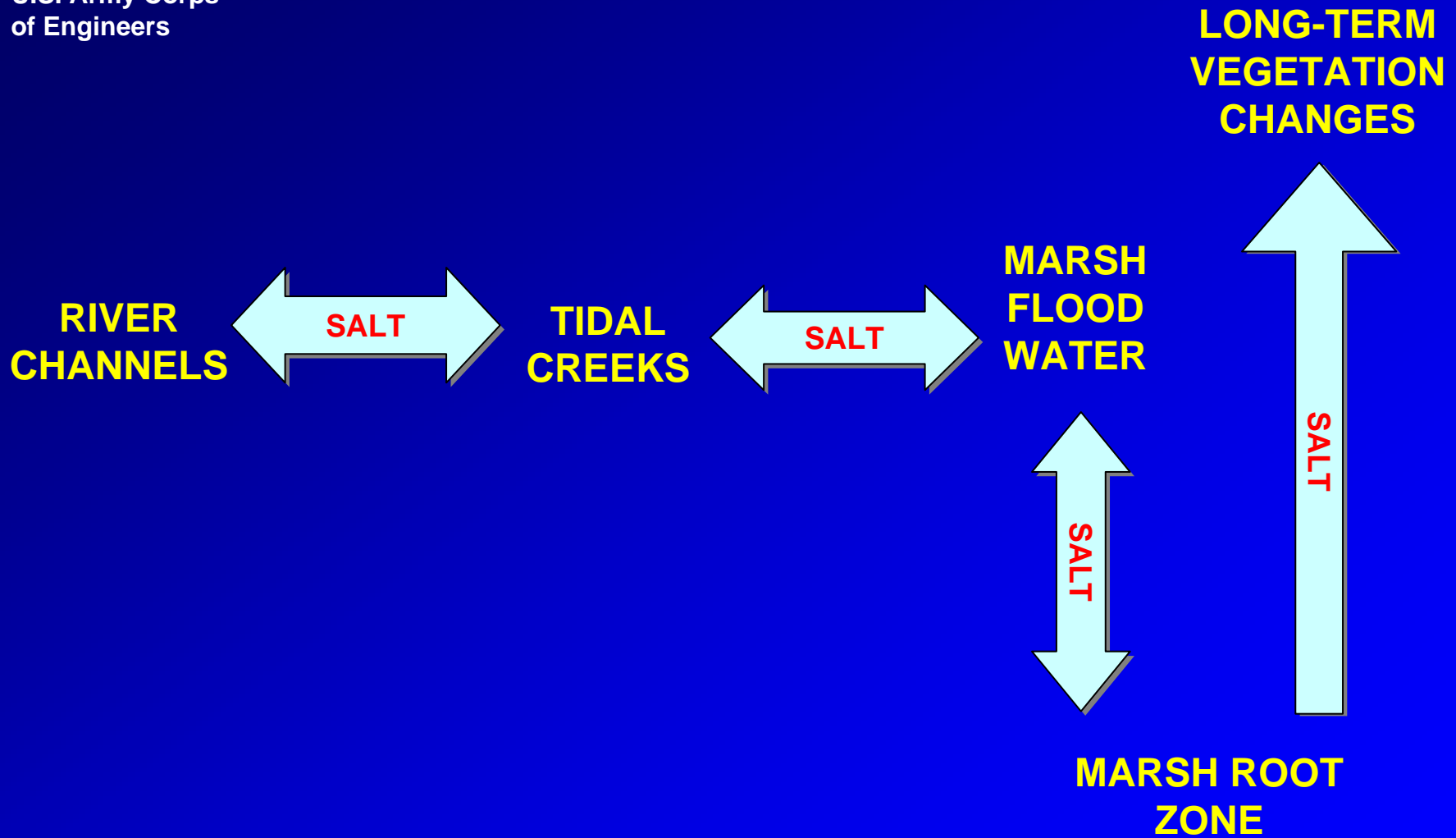
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So what's really going on ?



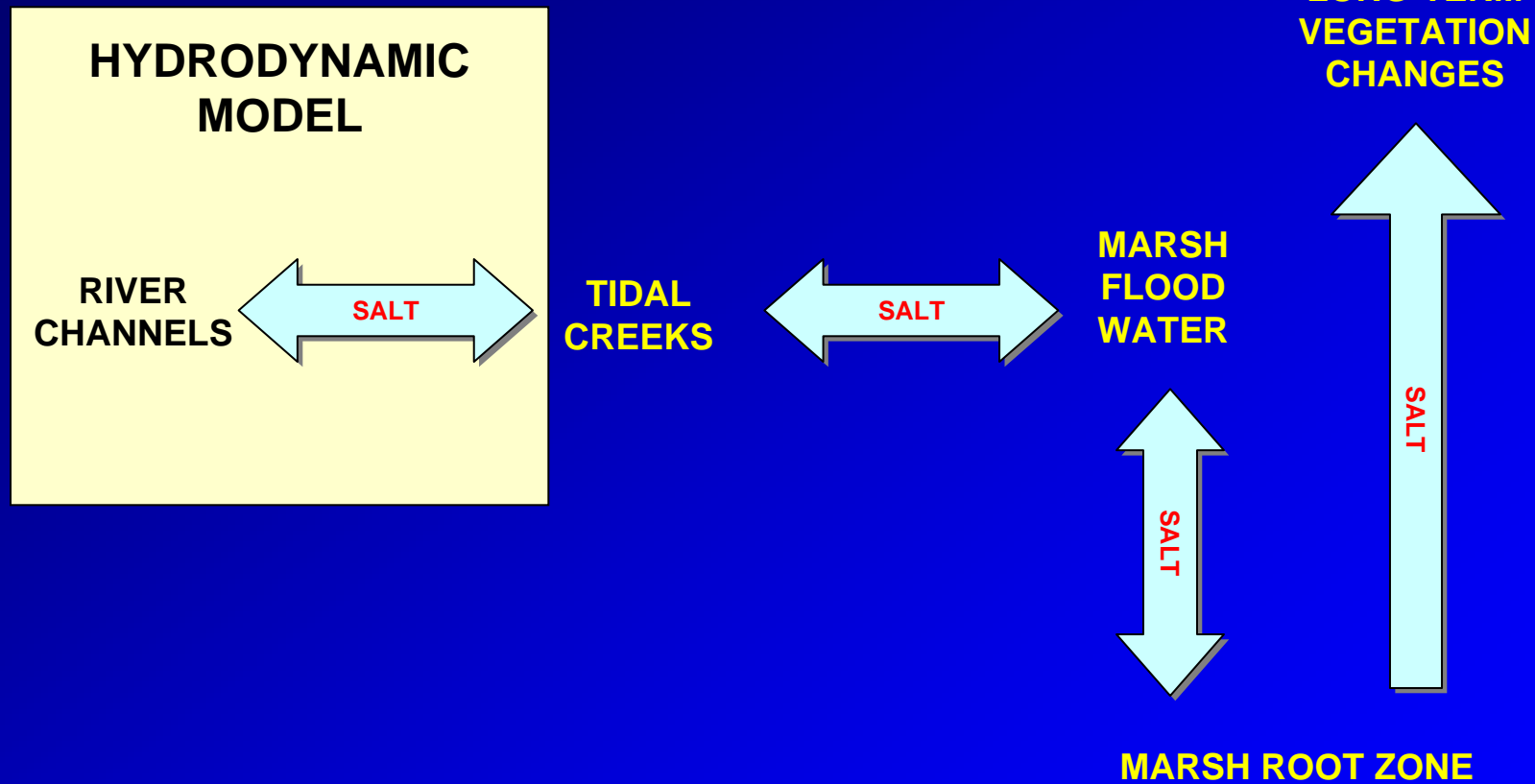
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Hydrodynamic Model

- **ATM: 1999 - 2004**
- **Tetra Tech: 2004 - 2005**
- **Predicts water surface elevation and salinity levels in main rivers in estuary**



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**LONG-TERM
VEGETATION
CHANGES**

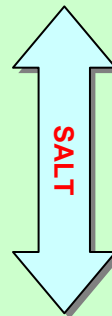
**RIVER
CHANNELS**



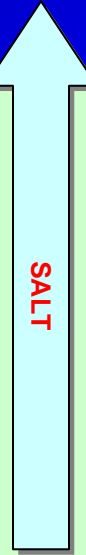
**TIDAL
CREEKS**



**MARSH
FLOOD
WATER**



MARSH ROOT ZONE



MODEL-TO-MARSH LINKAGE

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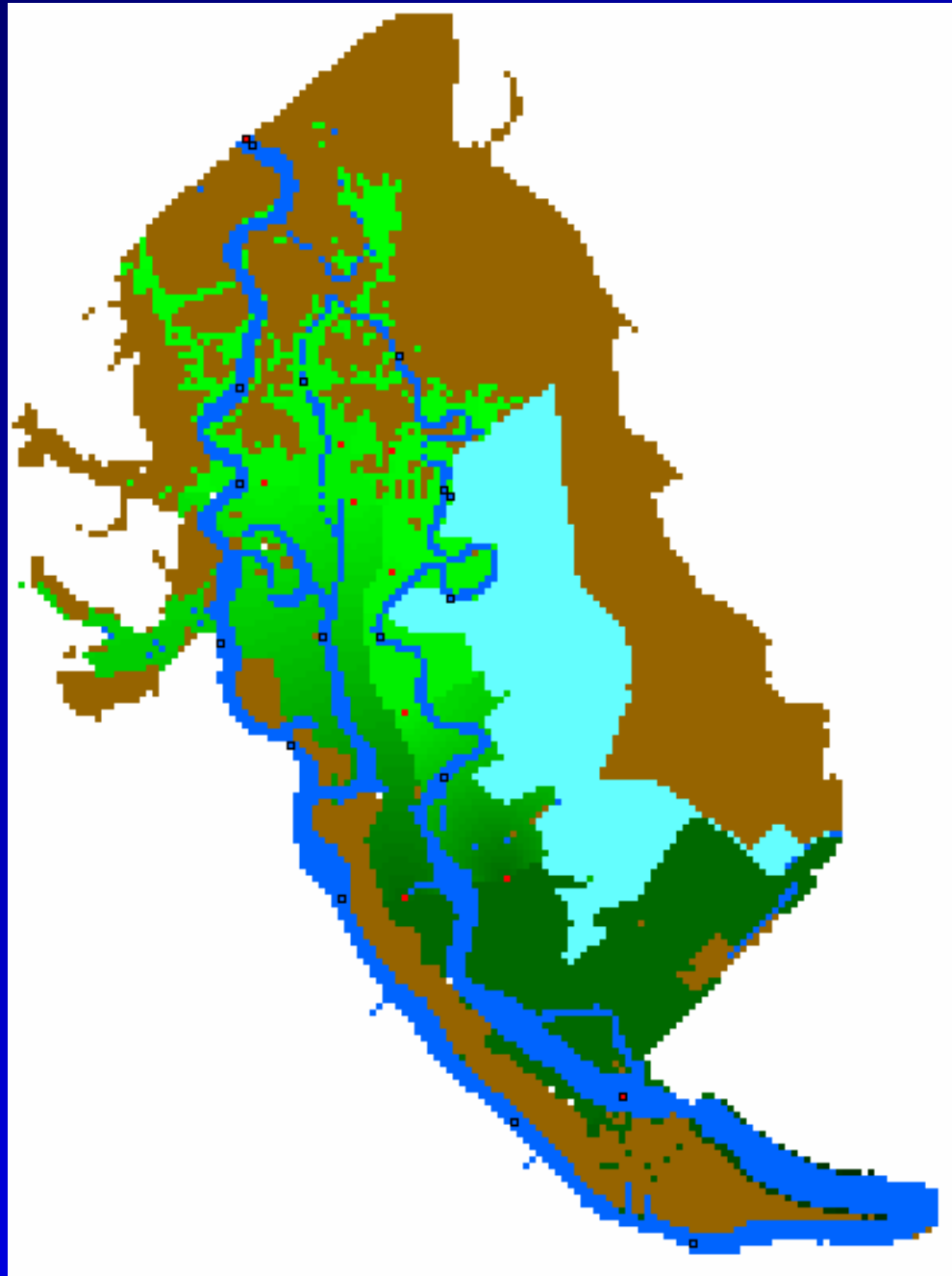
Model - To - Marsh Linkage

- **USGS: 2004 - 2005**
- **Translates water surface elevation and salinity in main rivers up the tidal creeks and into the root zone in marshes across the estuary**

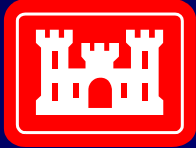


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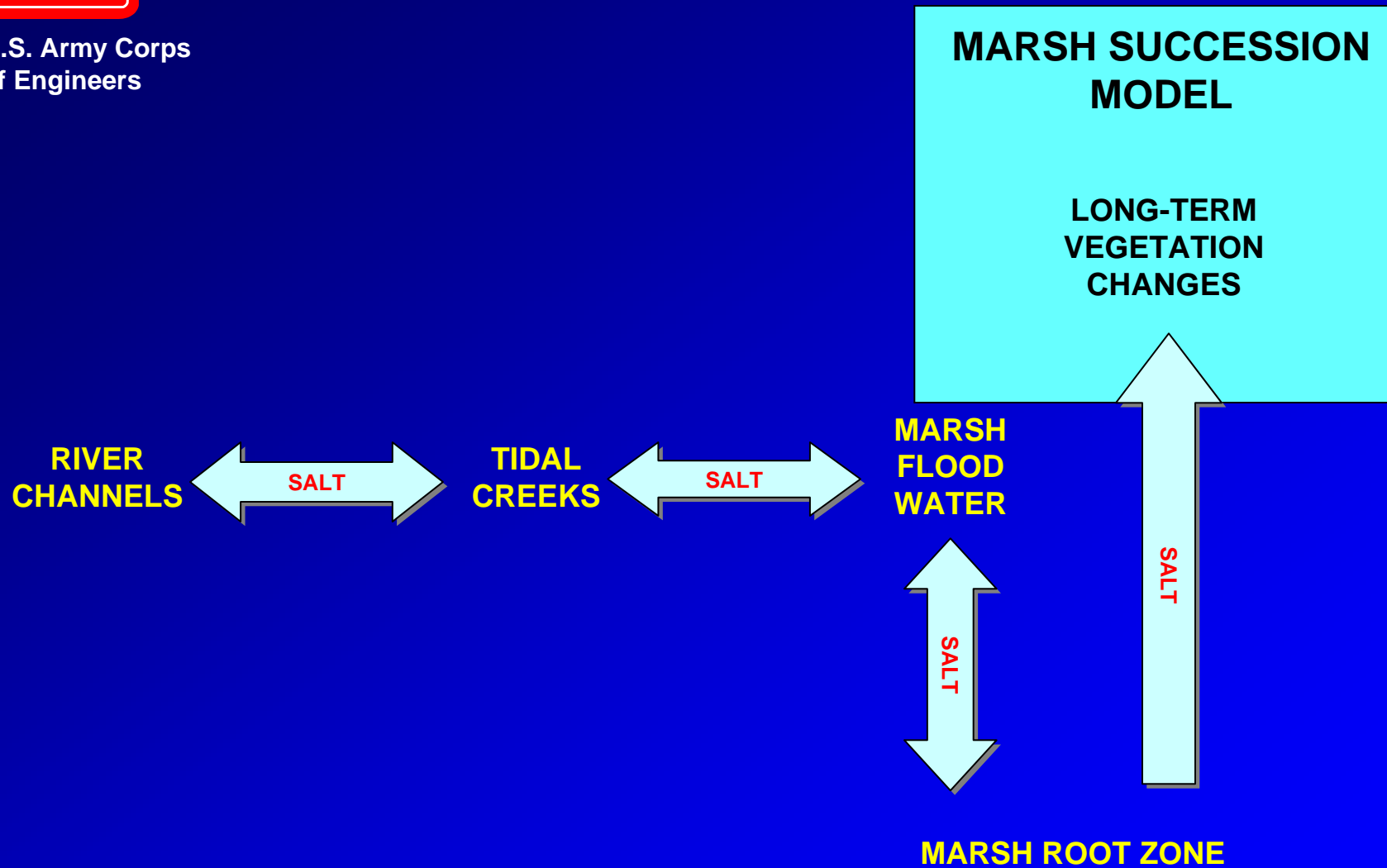
Predicted Marsh Salinities



USGS 2004



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Wetland Succession Model

- **ATM: 2002 - 2005**
- **Predicts changes in marsh vegetation in response to changes in either water surface elevation or salinity**



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Wetland Succession Model

- **GIS-based**
 - **Ground elevation**
 - **Water surface elevation**
 - **Type of soil**
 - **Distance from tidal creek**
 - **Salinity at root zone**



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Wetland Succession Model

- **Data collection**
 - **USFWS/USGS**
 - **7 sites**
 - **6 years (twice a year)**
 - **ATM**
 - **12 sites**
 - **6 years (intermittent – 8 events)**

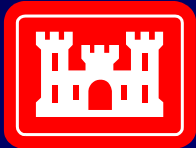


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Marsh Data Collection Sites

ATM 2002

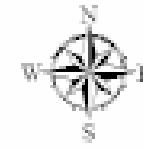
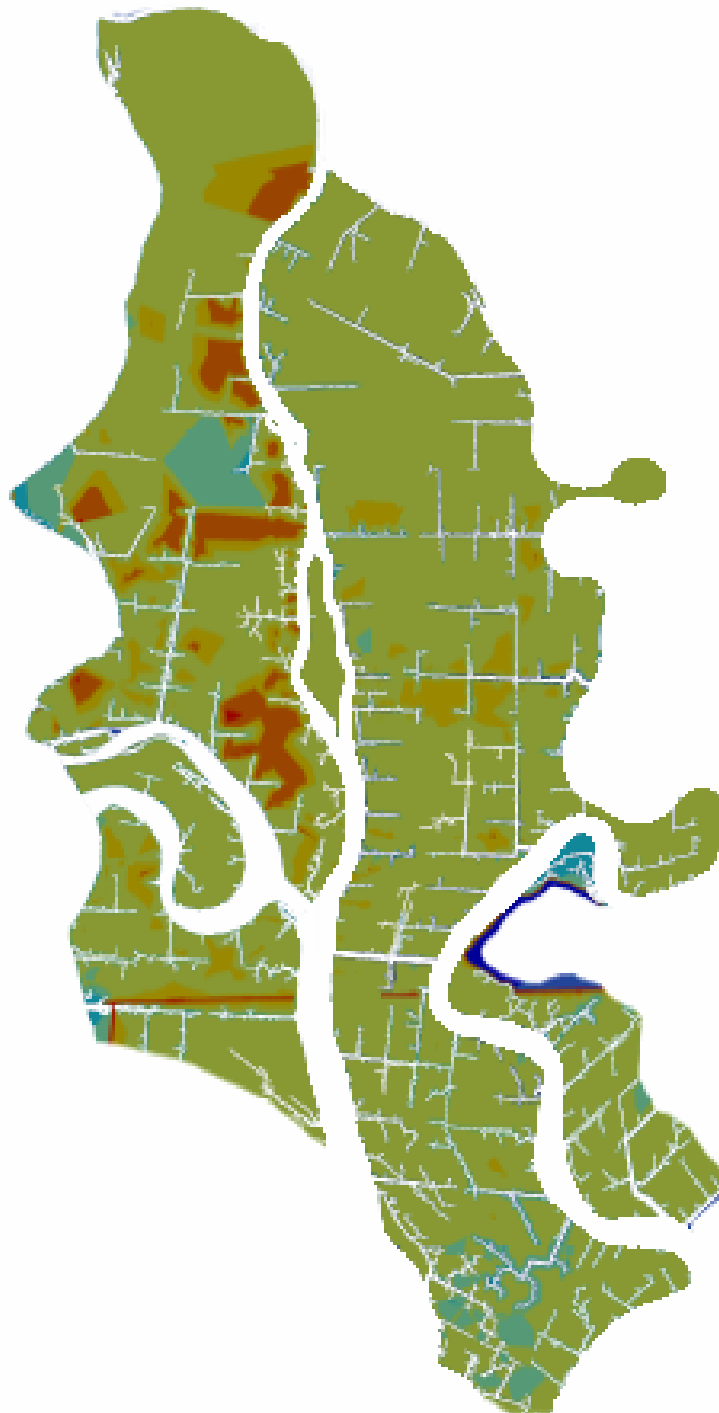




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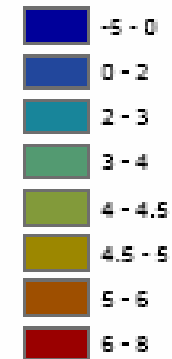
Marsh Elevation Surface Map

ATM 2003



Legend

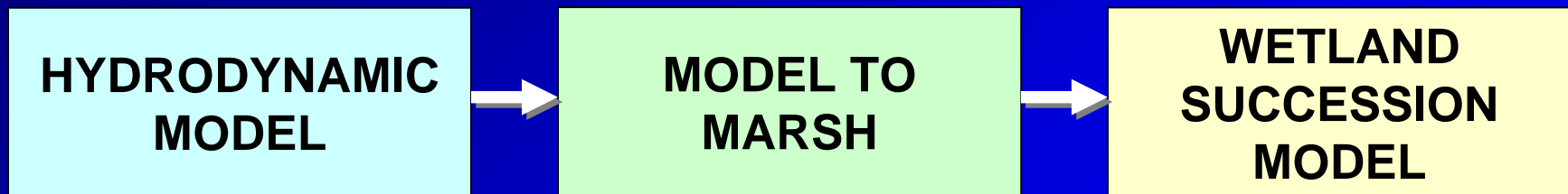
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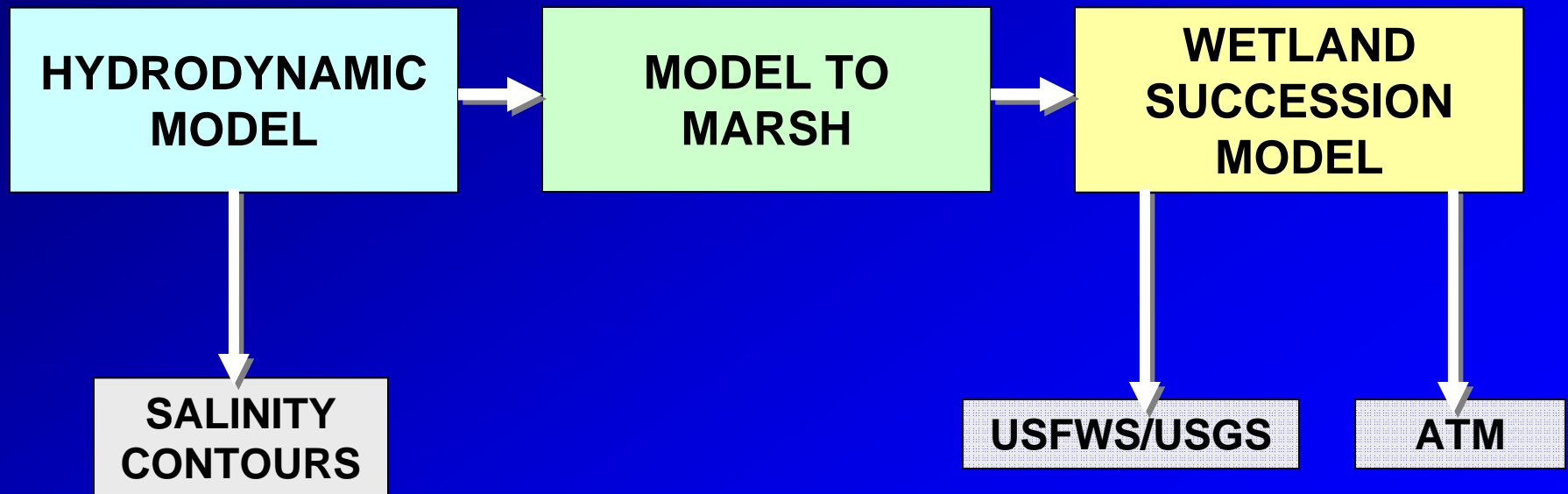
Wetland Succession Model

- **Will make 2 predictions**
 - **USFWS/USGS = community types**
 - **ATM = species or communities**



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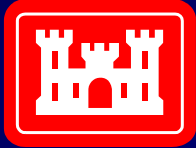


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SUMMARY

- **Will have 3 predictions to judge potential project effects on estuarine wetlands**
 - **One tried & true**
 - **Two state-of-the-art**
- **No results are presently available = Development of the tools has taken much longer than anticipated**



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QUESTIONS ?
