The St. Andrew Bay Watershed Stormwater Management

Collection, Organization, Options and Prioritization (CO-OP) Project

for

The St. Andrew Bay Environmental Study Team (BEST)

The Team

- McGlynn Laboratories Inc (NELAC Water Quality Certified)
- Scott Matteo Engineering (City of Tallahassee Stormwater Engineering)
- Emerald Coast Design Build (35 years Coastal Engineering)
- Kevin Speers, FSU Oceanography (30 years experience in modeling)
- Jim Griffin, USF-FCCDR (30 years experience with TMDLs, Watershed Plans and the SFWMD)

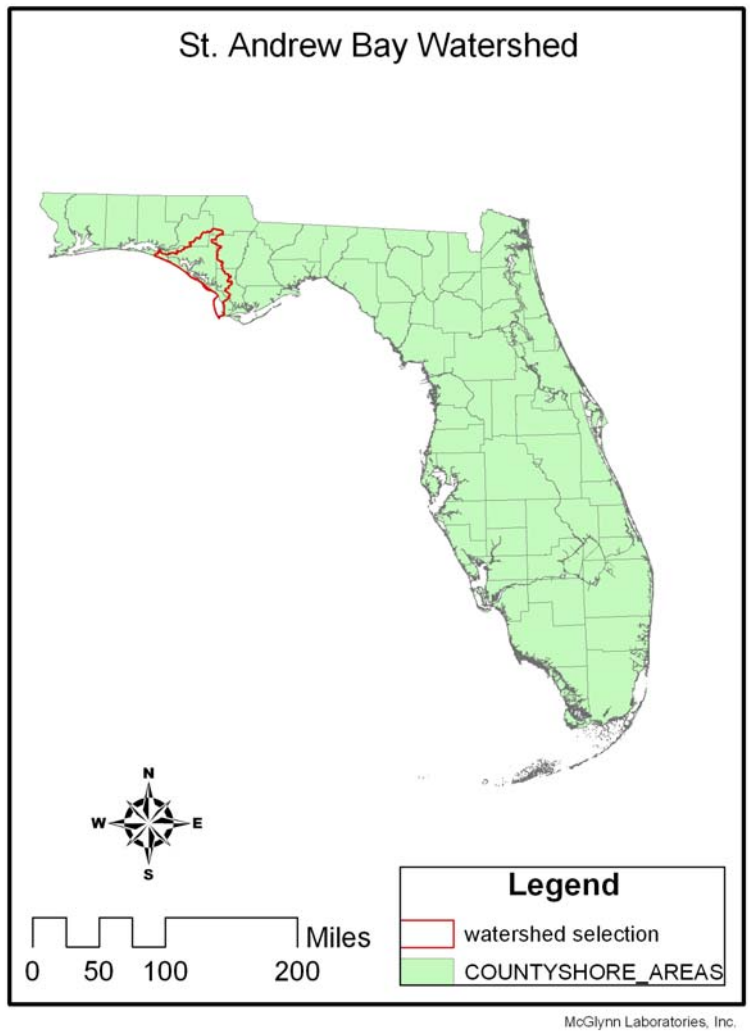
Our Proposal Includes

- (1) Web-based database
- (2) Watershed Management Plan
- (3) Geospacial stormwater models
- (4) Circulation model of St. Andrew Bay coupled with the stormwater model.

Stormwater

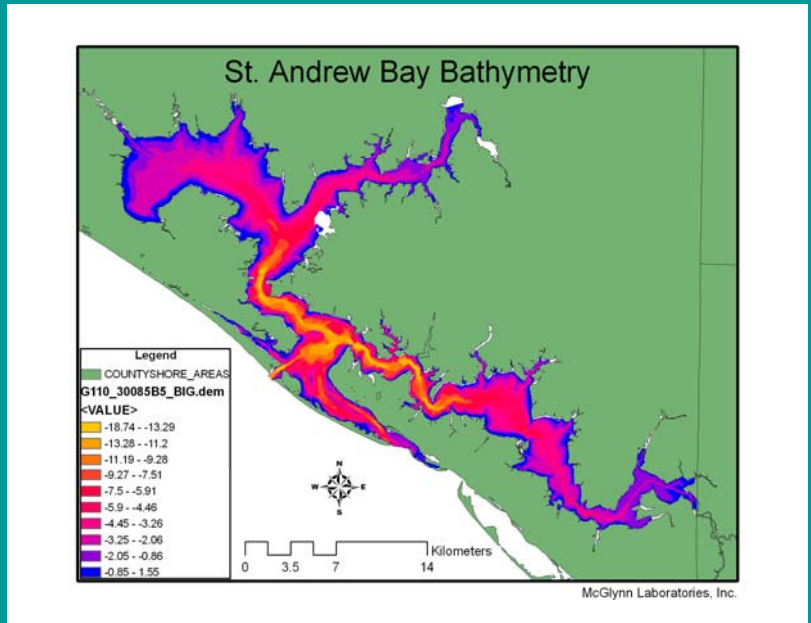
- Stormwater comes from 700,000 acres
- Stormwater flows to the 70,000-acre Bay
- And some Lakes too

- Stormwater flooding
- Stormwater pollution



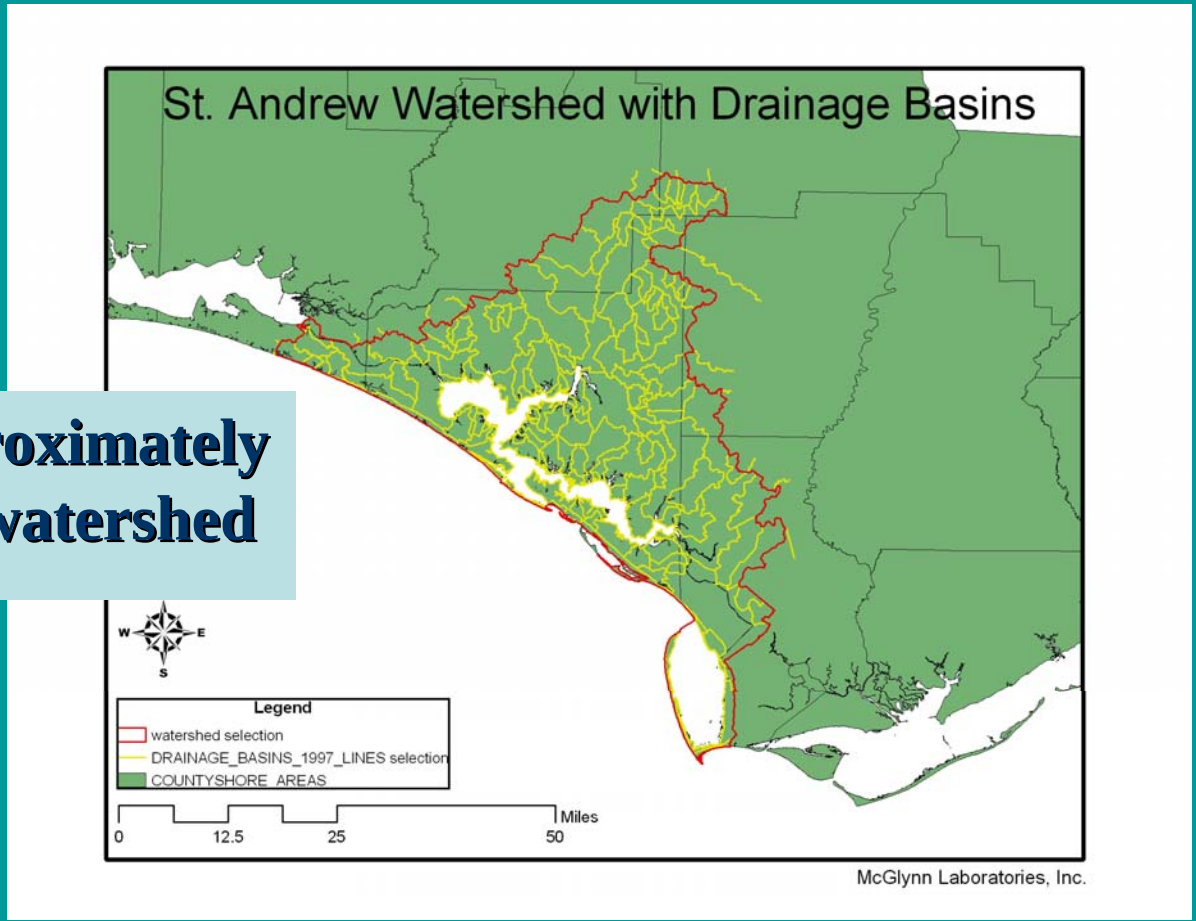
St Andrew Bay

- **The Bay and associated beaches are**
  - world class natural resource
  - drive an economic engine
  - attract people
  - the foundation for socio-economic prosperity and development in the region.



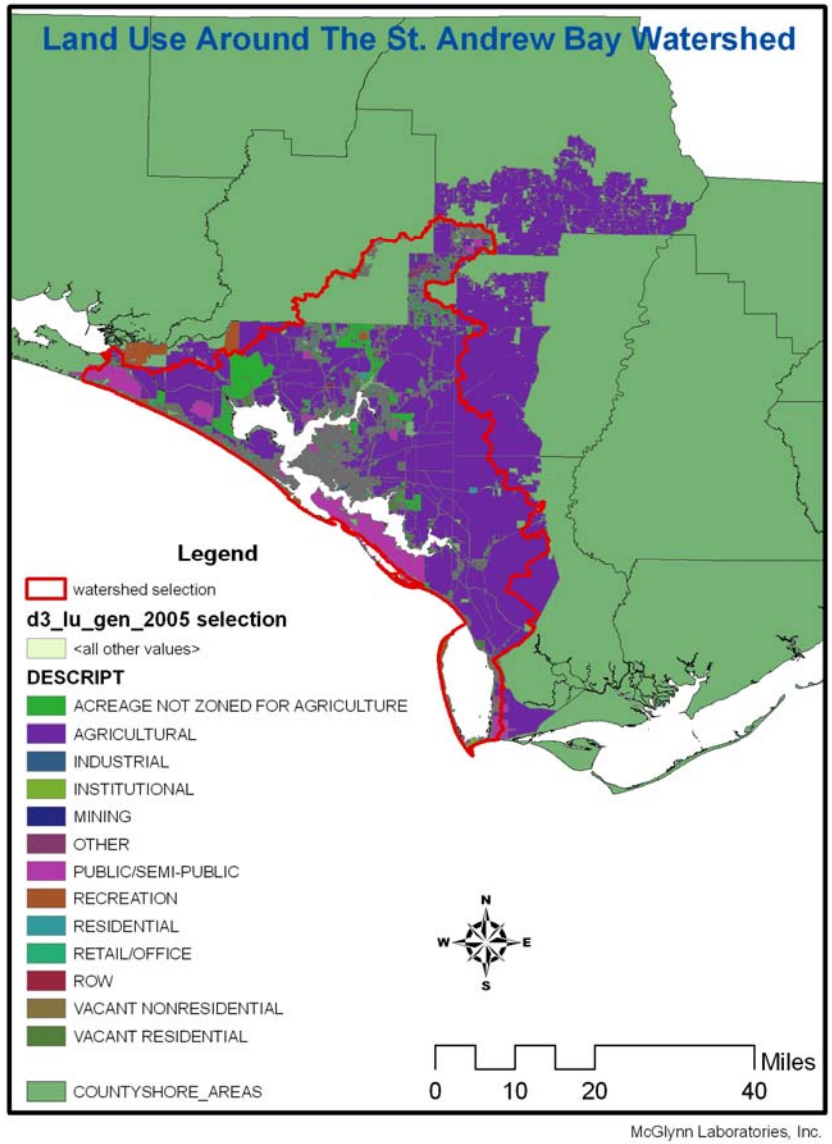
HUs or Sub-Watersheds

- **There are approximately 80 HUs in the watershed**



Landuse Data

- 99 Landuse Categories
- Collapsed to 15
- University of Florida
- Geoplan Center
- 12/31/05



Land Use Around Callaway Bayou

Legend

DRAINAGE_BASINS_1997_LINES selection

d3_lu_gen_2005 selection

<all other values>

DESCRIPT

- ACREAGE NOT ZONED FOR AGRICULTURE
- AGRICULTURAL
- INDUSTRIAL
- INSTITUTIONAL
- MINING
- OTHER
- PUBLIC/SEMI-PUBLIC
- RECREATION
- RESIDENTIAL
- RETAIL/OFFICE
- ROW
- VACANT NONRESIDENTIAL
- VACANT RESIDENTIAL

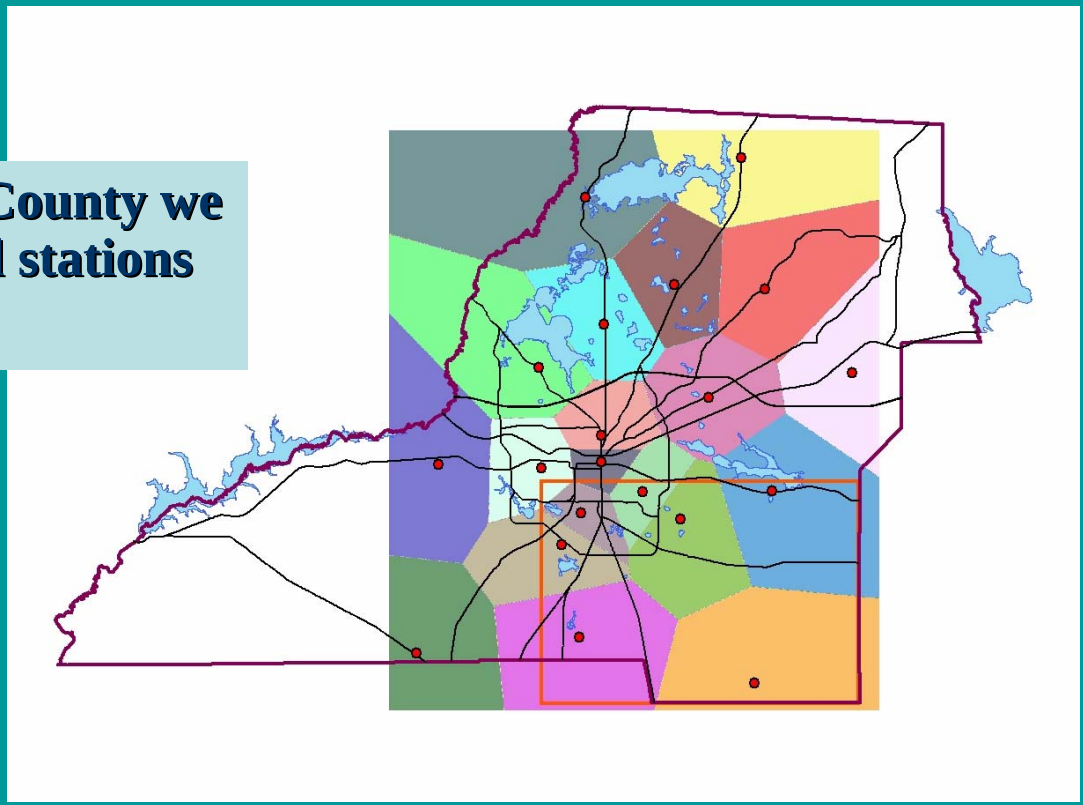
N

0 1,500 3,000 6,000 Feet

McGlynn Laboratories, Inc.

Rainfall Coverage

- **For WAM in Leon County we used over 19 rainfall stations in Leon County**



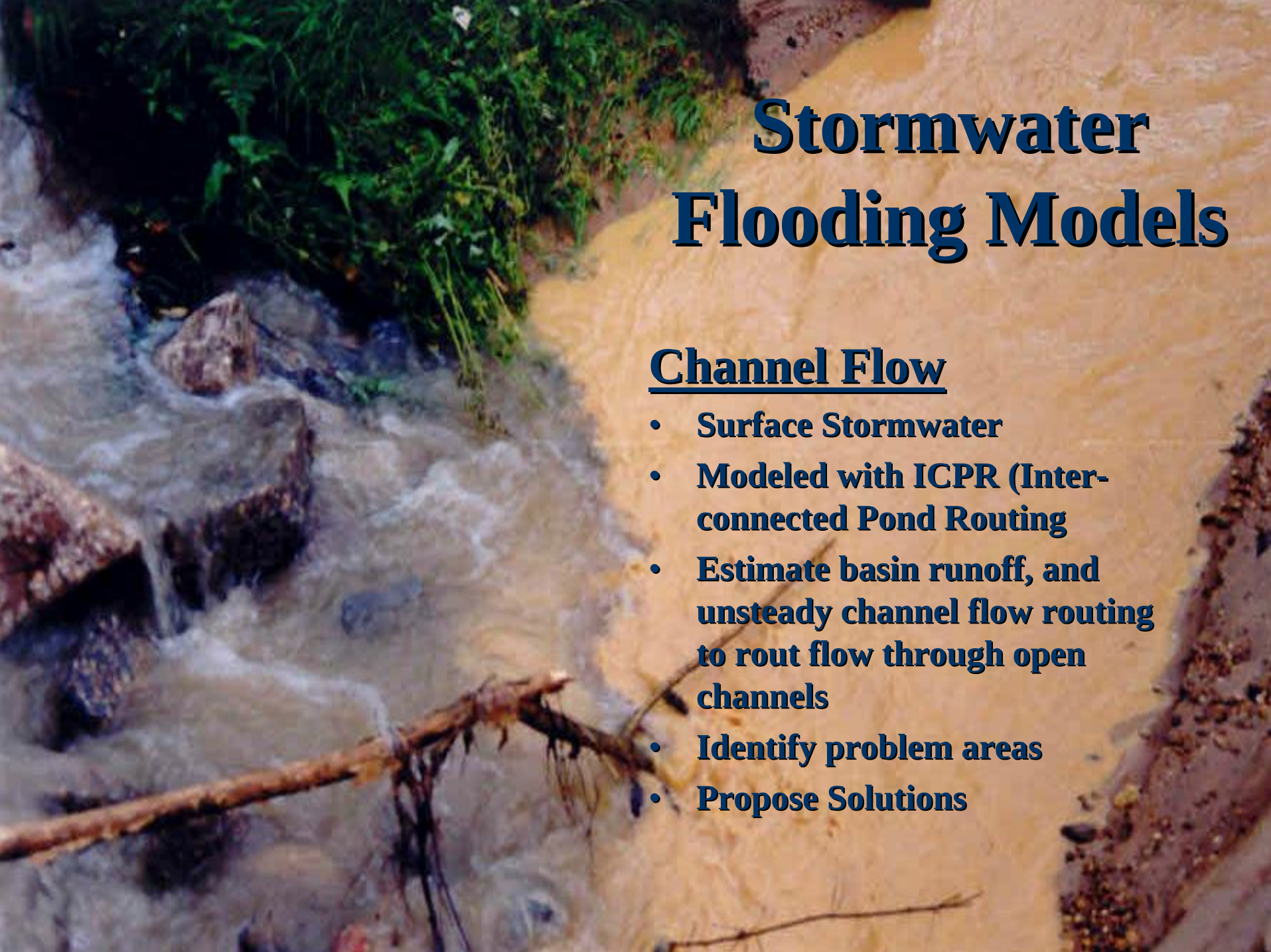
1) Flood Prevention

- Prevent flooding
- Improved flood control in areas currently receiving insufficient protection
- Improve water quality

Stormwater Flooding Models

Existing Models

- Evaluate existing stormwater hydrodynamic modes (DFIRM maps).
- Utilize all good work
- Propose data gaps



Stormwater Flooding Models

Channel Flow

- Surface Stormwater
- Modeled with ICPR (Inter-connected Pond Routing
- Estimate basin runoff, and unsteady channel flow routing to rout flow through open channels
- Identify problem areas
- Propose Solutions

Stormwater Flooding Models

Pipe Systems

- In more urbanized areas
- Model stormwater in complex pipe systems
- WMM Model
- Use kinematic wave methodology to estimate flows and unsteady channel flow routing to rout flow through open channels.
- Identify deficiencies
- Propose Solutions

Stormwater Flooding Models

Mounding

- Surface water modeling alone will yield inaccurate results
- Utilize MOD-RET
- Model groundwater which rises when ground becomes saturated
- Identify flood prone areas
- Propose Solutions

Stormwater Flooding Models

Sewage Infiltration

- Flooding also causes the breakdown of sewage treatment systems.
- Infiltration and pop-offs in municipal systems cause problems
- Inundation of septic systems cause problems
- Identify health and water quality concerns
- Propose Solutions

Stormwater Flooding Models

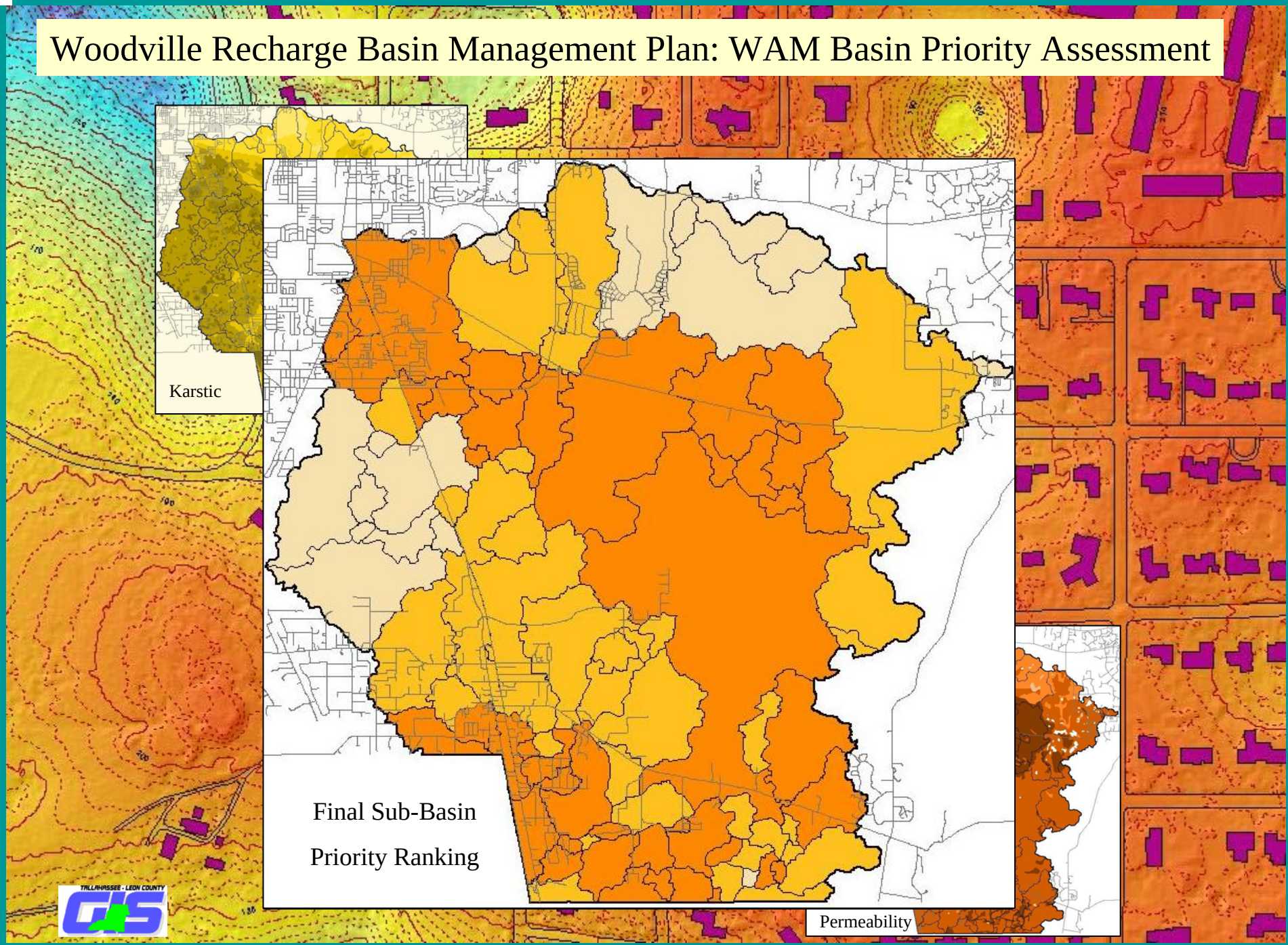
Storm Surge Analysis

- Analyze extreme events
- Analyze sea-level response
- Analyze historic water level data
- Statistical analysis (e.g. lagged correlations)
- Determine the response to offshore surge

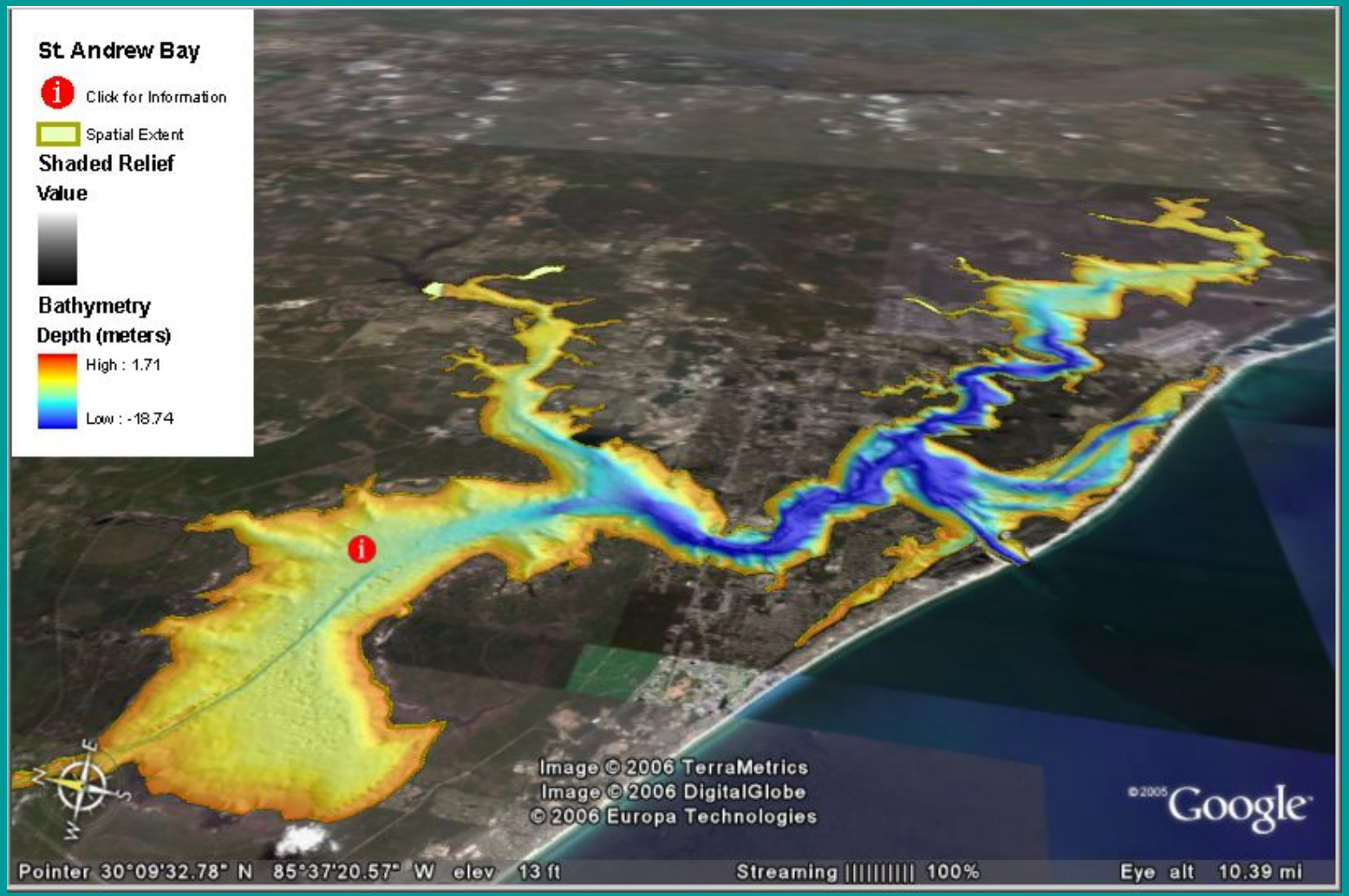
2) Current and Future Water Quality

- Assess current surface water quality concerns
- Develop a surface water quality model/planning tool (WAMview)
- Use WAM to identify projects to improve WQ
- Use WAM to identify BMPs to improve WQ

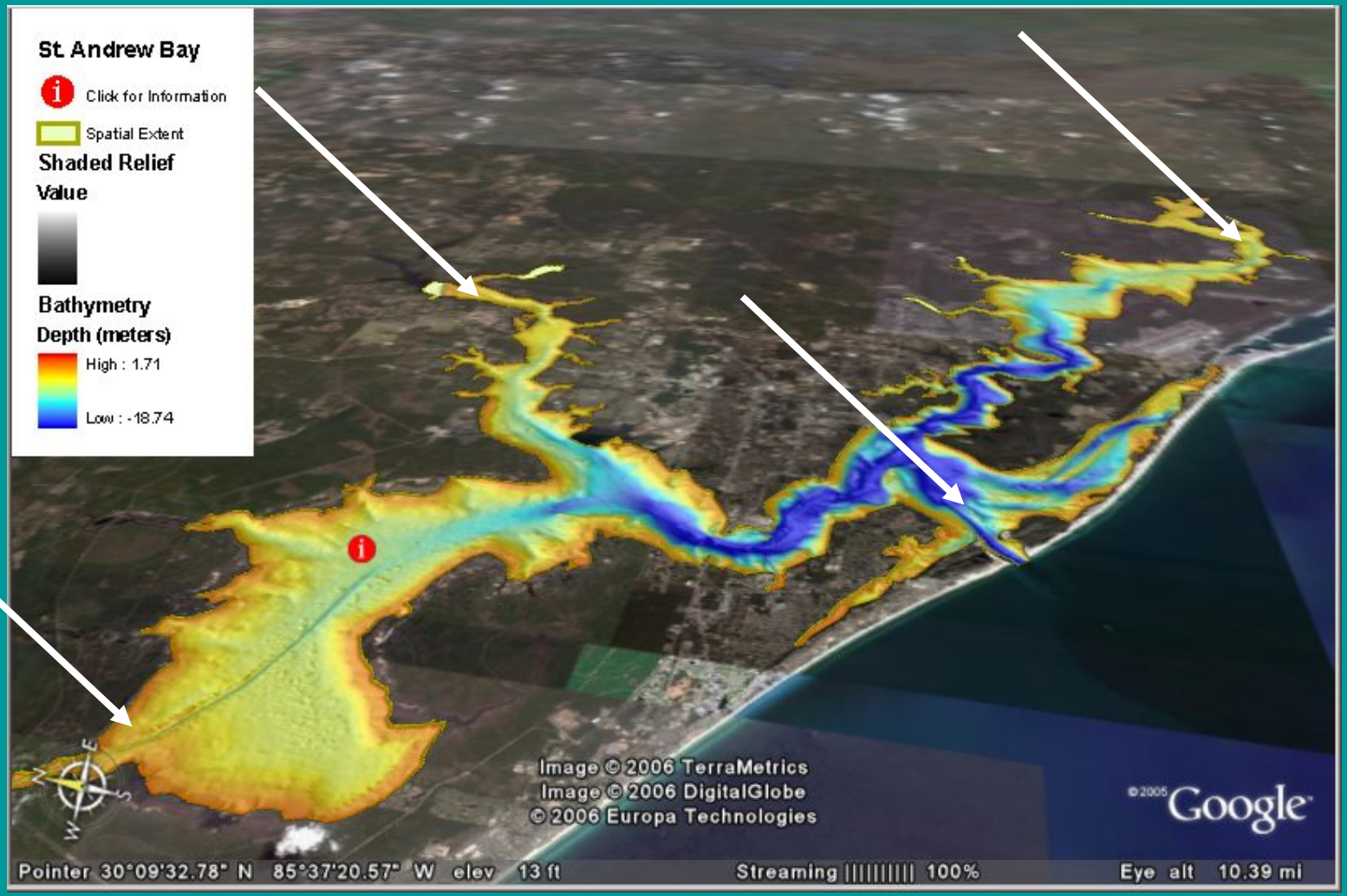
Woodville Recharge Basin Management Plan: WAM Basin Priority Assessment



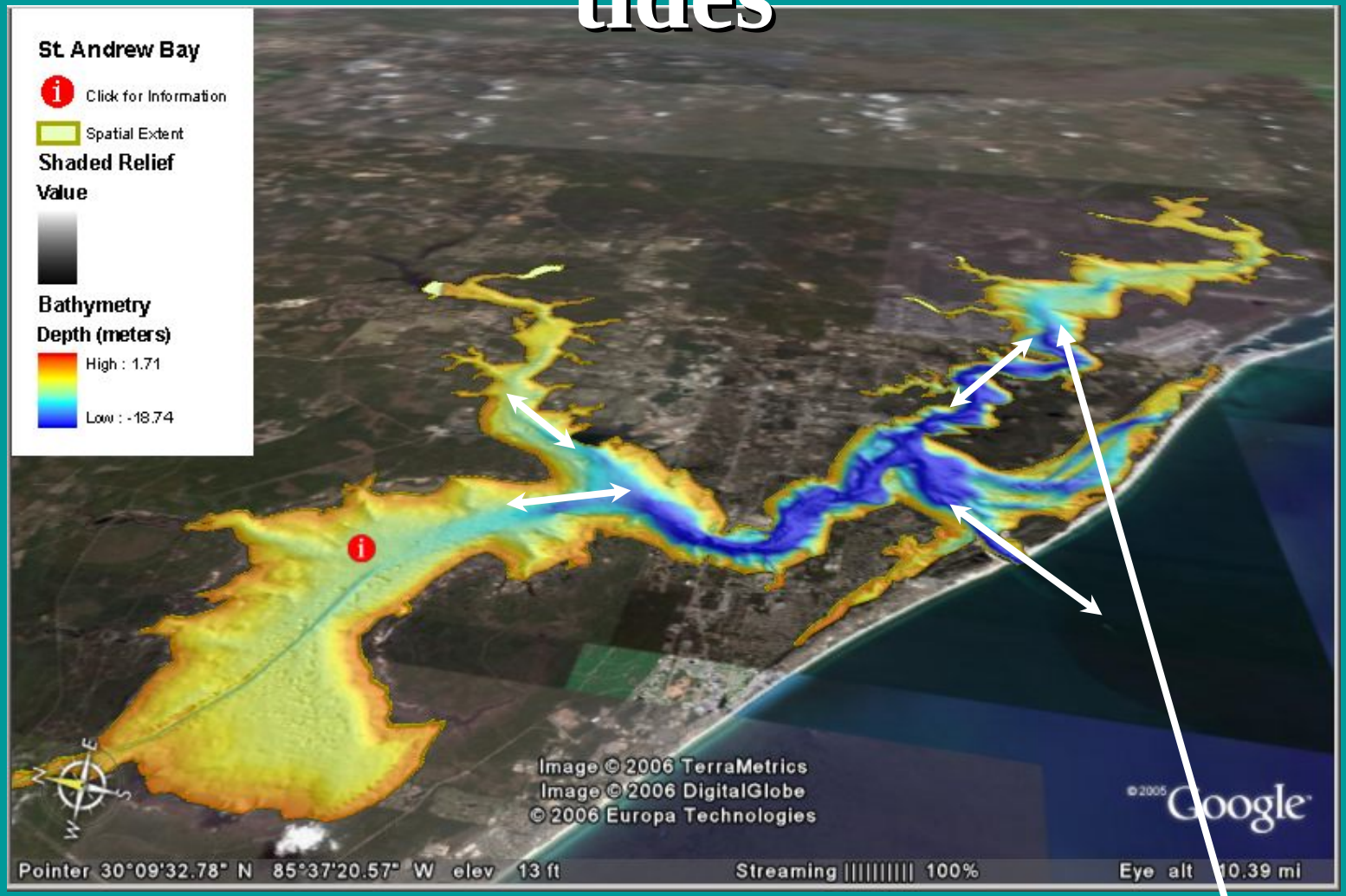
St Andrew Bay



Primary Inputs and Outputs

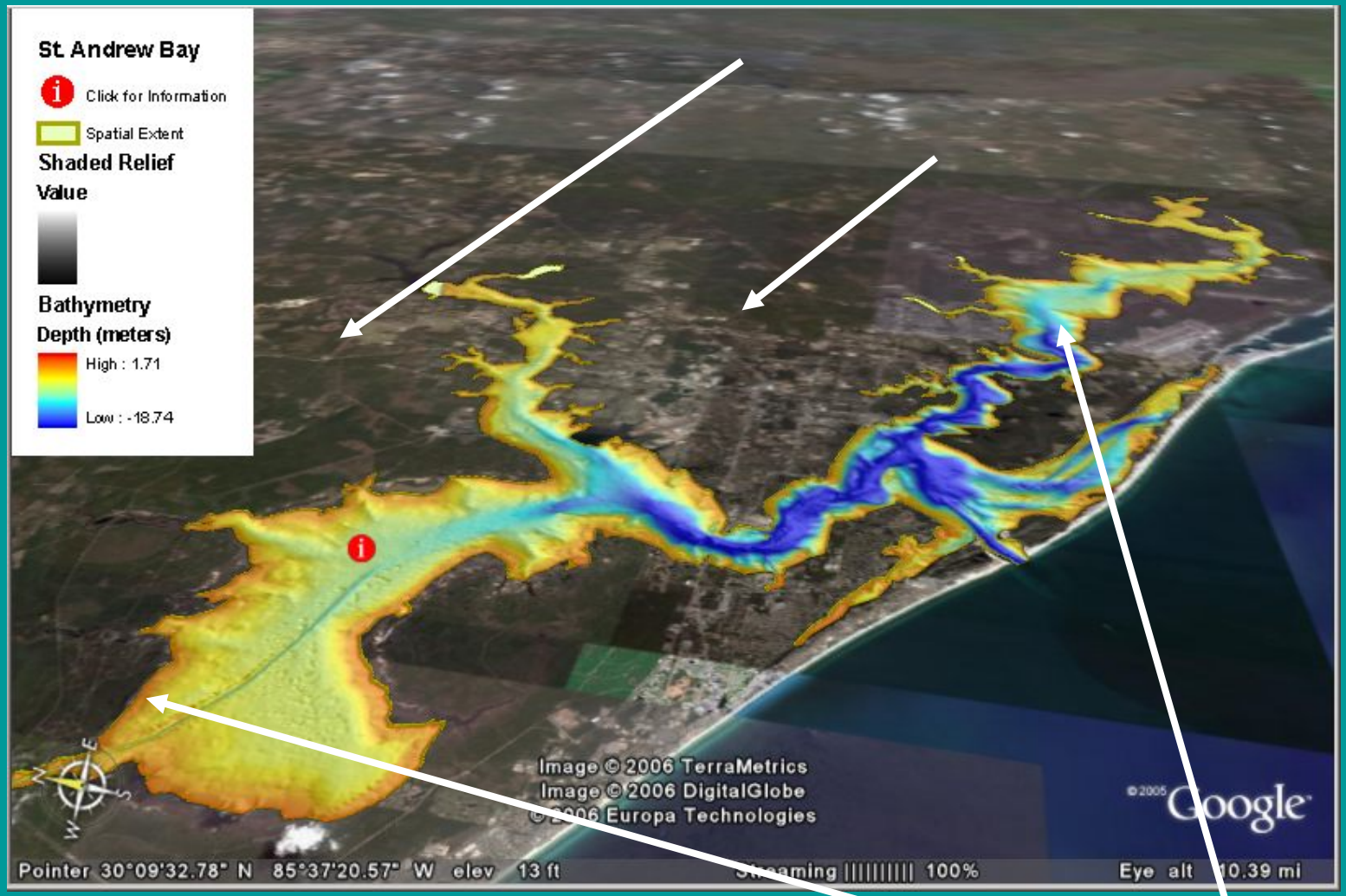


Water moves in and out with the tides



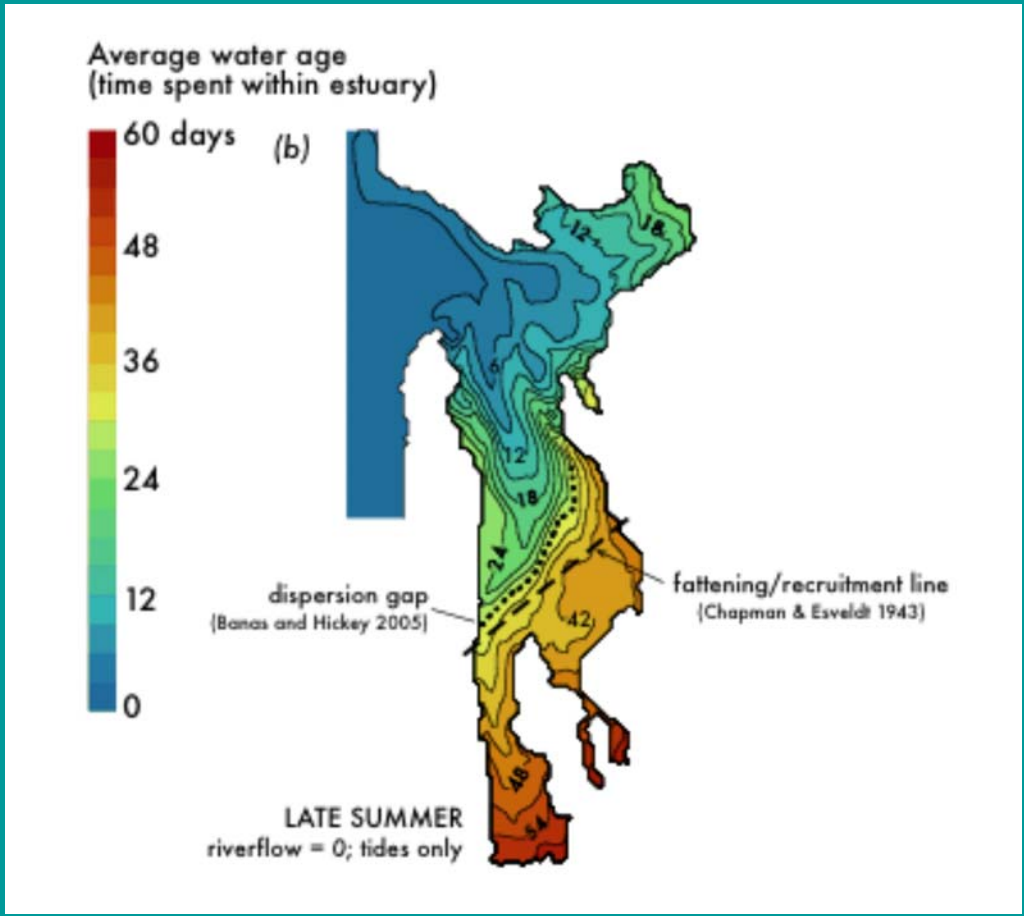
The Bay level moves up and down

When the wind blows…



The Bay level moves up and down

Tides mix the Bay non-uniformly



1. Water farther from head is older

2. Tides mix bay strongly near head and near end

3. Weak tidal mixing in-between creates a barrier to exchange of nutrients and recruitment

Banas et al 2006

Winds can drive water across barriers

So both aspects -tides and wind - need to be accounted for in models of transport in the Bay

Consider a conceptual model with these two mechanisms stirring and mixing nutrients and salinity

Conceptual model

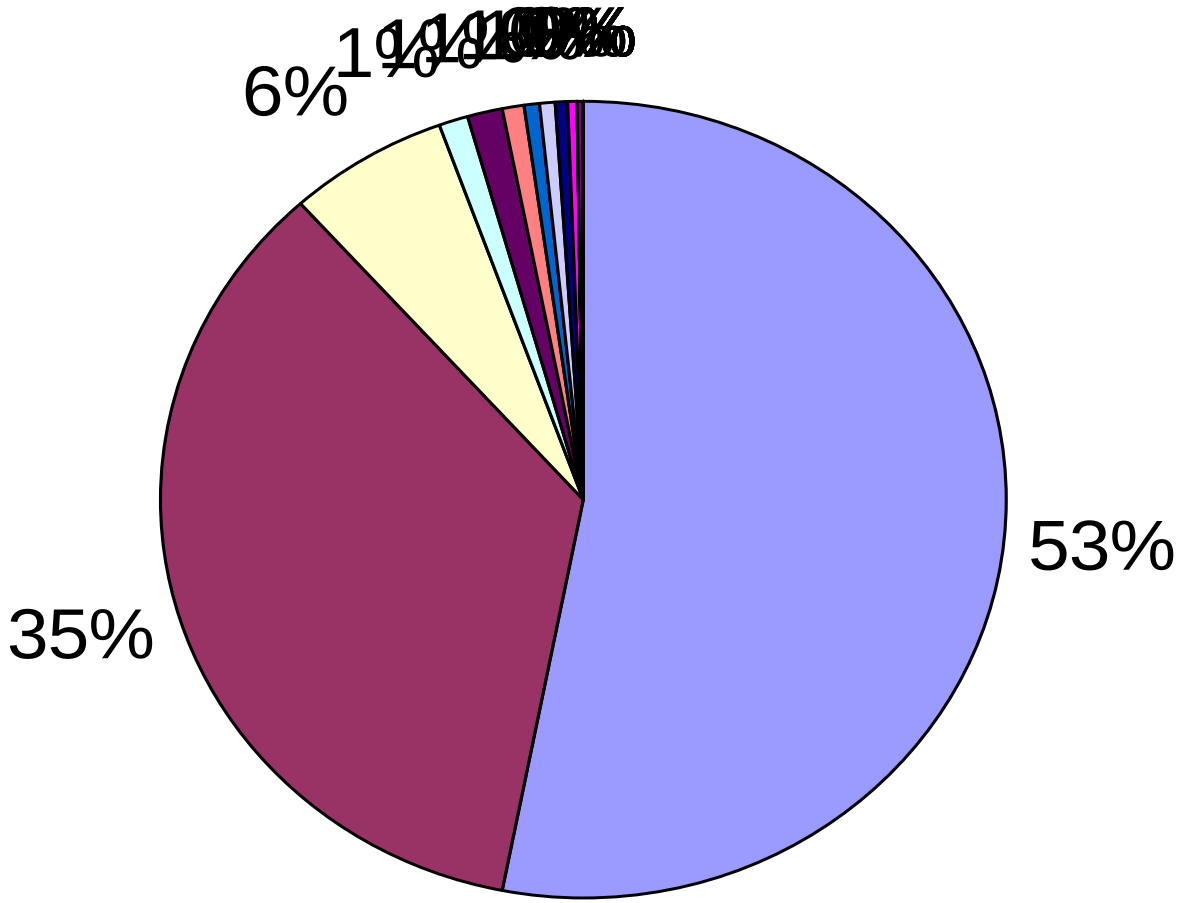
Current U = $\Im$ (Wind forcing)

Mixing coefficients K = Φ(tidal excursions)

Where $\Im$ and Φ are functional dependencies determined from observations of salinity and currents (and winds).

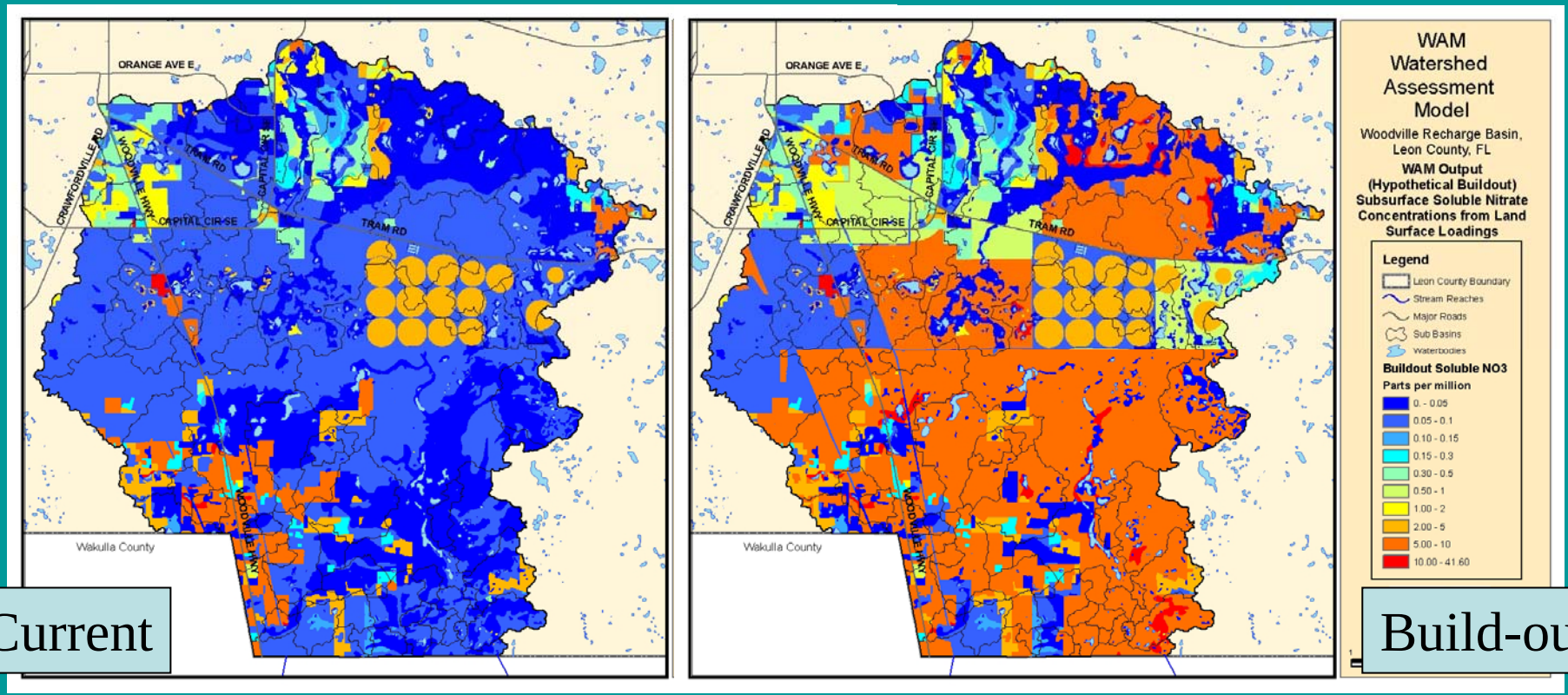
These (U and K) are then used in WAM for determining ultimate fate of stormwater loading

Nitrate Loading (KG/YR)



- Municipal Sprayfield
- Medium Density Residential
- Low Density Residential
- Coniferous Plantations
- High Density Residential
- Improved Pasture
- Industrial
- Scrub and Brushland
- Barren Land
- Unimproved Pasture
- Cypress
- Managed Landscape
- Commercial and Services
- Hardwood Conifer Mixed
- Prisons
- Mining
- Undeveloped Urban Land
- Wetland Forested Mixed
- Rural Land in Transition
- Open Water
- Freshwater Marshes

Pollutant Loading Predictions

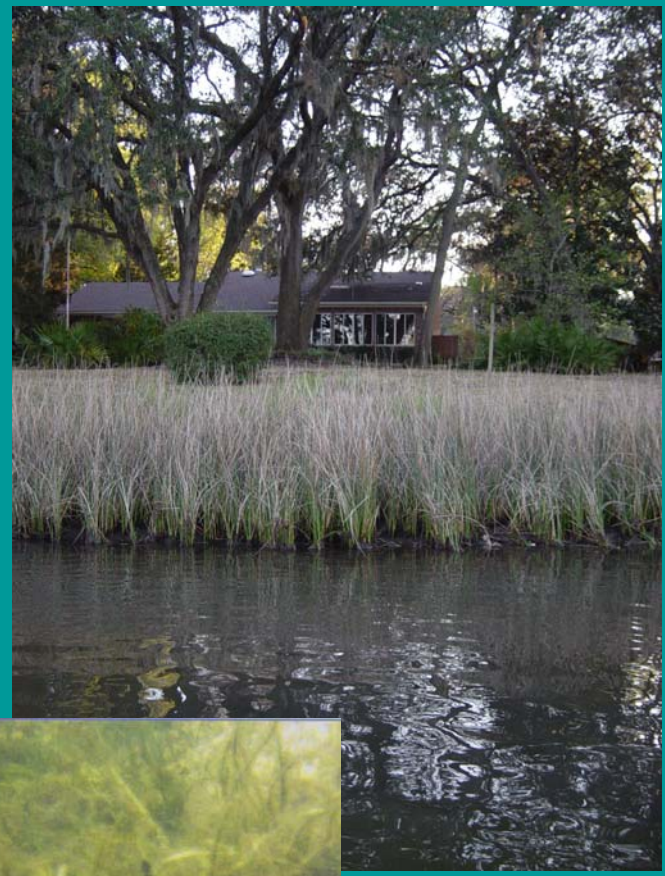


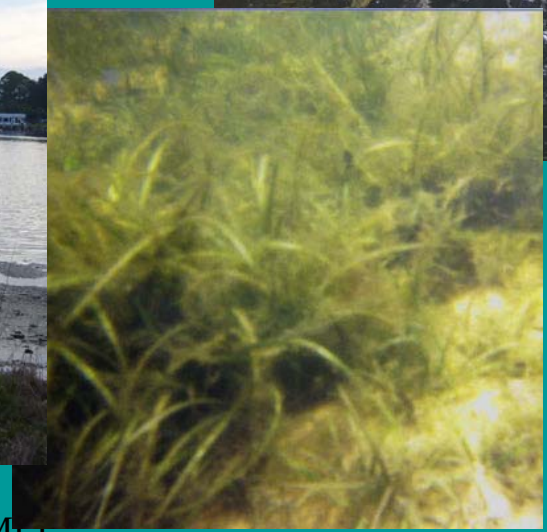
Current

Build-out

3) BMPs

- **Increase the capacity of St. Andrew Bay to absorb nutrients**
- **Implement Best Management Practices (BMPs).**





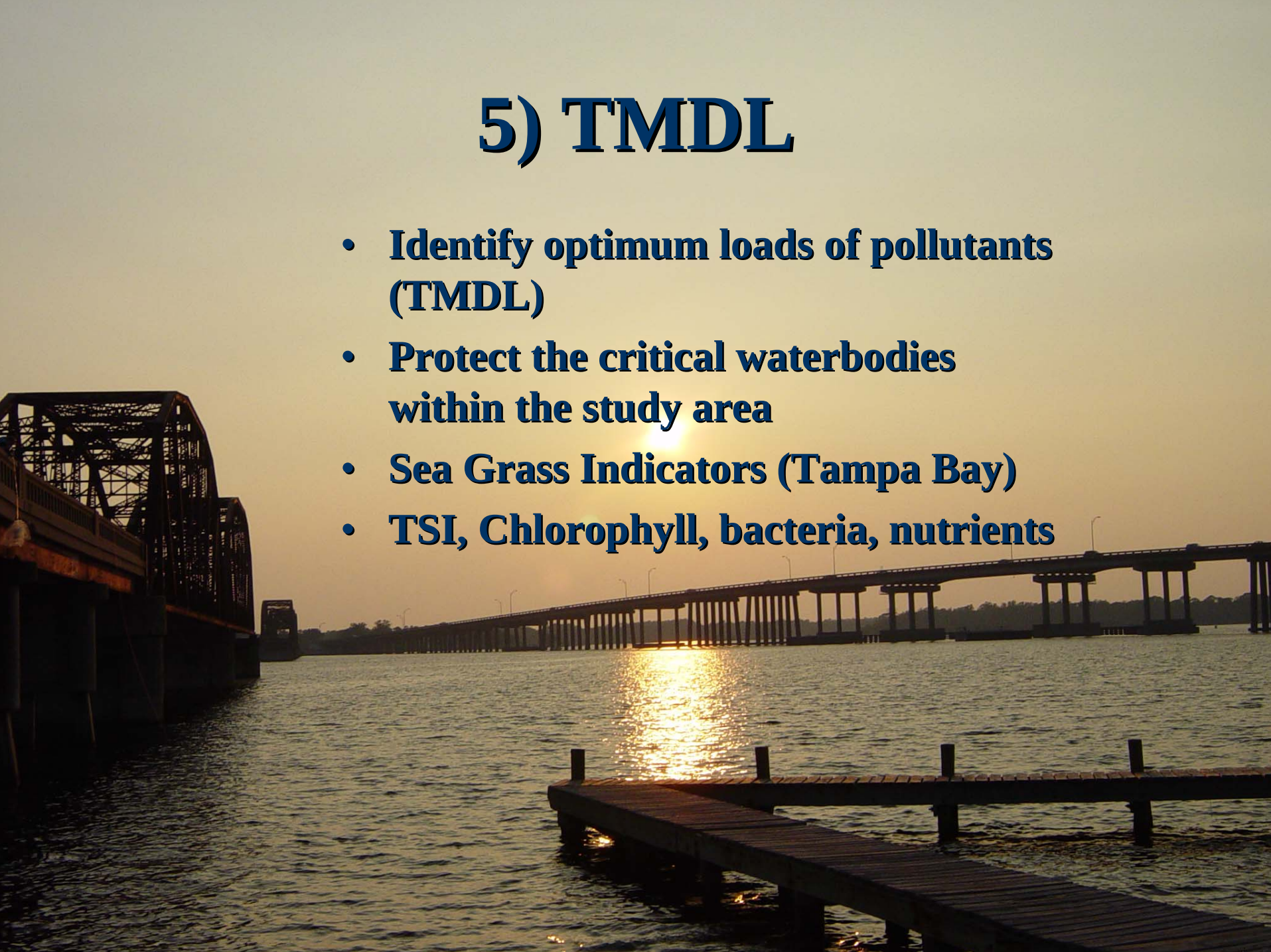
4) Stormwater Projects

Propose projects to:

- **Decrease flooding**
- **Capture stormwater**
- **Increase water storage**
- **Increase capacity**
- **Increase conveyance**
- **Increase water supplies**
- **Improve water quality**

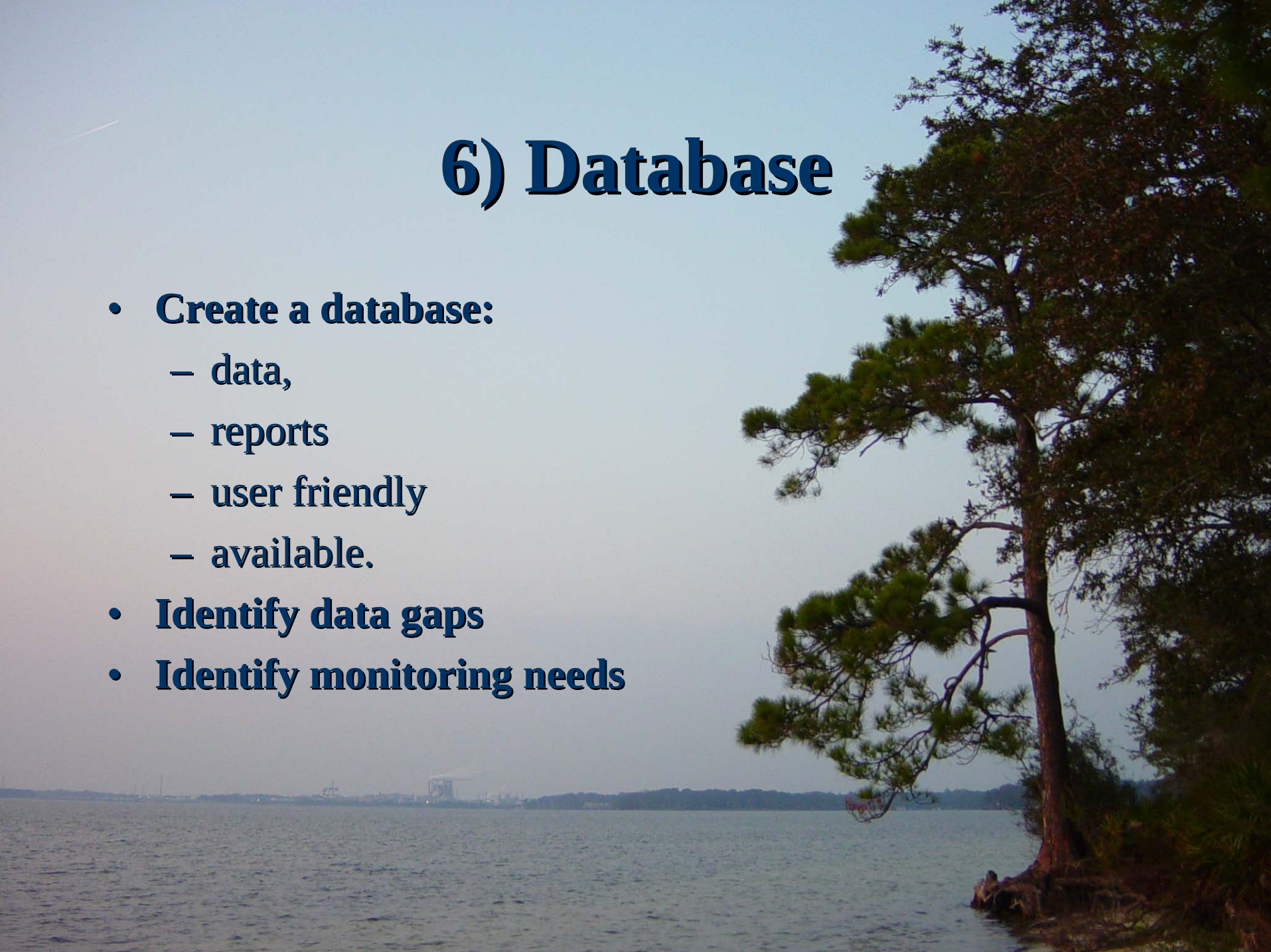
5) TMDL

- Identify optimum loads of pollutants (TMDL)
- Protect the critical waterbodies within the study area
- Sea Grass Indicators (Tampa Bay)
- TSI, Chlorophyll, bacteria, nutrients



6) Database

- **Create a database:**
  - data,
  - reports
  - user friendly
  - available.
- **Identify data gaps**
- **Identify monitoring needs**



Time Line

Time Zero

Begin Water Atlas

Begin Modeling

6 Months

Water Atlas Enhanced

Data Gaps and Needs Report

12 Months

Stormwater Options Report

18 months

Final Stormwater Action Plan and WQ Management Report

Specifics

- The WAM Model is easy to use for those familiar with GIS and Water Quality
- WAM is a great planning tool
- WAM models NPDES pollutants
- WAM can predict future water quality based on Landuse and Development

Goals

- Attend BEST meetings
- Make all data accessible in the Water Atlas
- Assist with public education
- Interact with stakeholders
- Submit weekly updates of progress
- Propose good projects
- Identify funding sources
- Protect the watershed from flooding
- Preserve water quality
- Enhance the ecosystem
- Improve the watershed

Lake Martin

- **TMDL Experience**
  - Ochlockonee River
  - Wakulla River
  - Choctawhatchee River
  - Lake Lafayette
  - Choctawhatchee Bay
- **Watershed Management Plan Experience**
  - St Marks Watershed
  - Woodville Recharge Basin
  - Lafayette Watershed
  - Lake Tallavana
  - Killearn Chain of Lakes
  - Choctawhatchee Bay
  - Ochlockonee Bay
  - Perdido Bay