Peace River Cumulative Impact Study

DEP Bureau
of Mine Restoration.

Subconsultants

- **HydroGeoLogic**
- **The Nature Conservancy** (Brian Richter)
- **EarthBalance**
- **Longman, Lewis & Walker, P.A.**
- **Avineon**
- **W. Dexter Bender** (Tom Fraser)

Overview

- Project Background
- Key Watershed Stressors
- Project Approach
- CHNEP Involvement

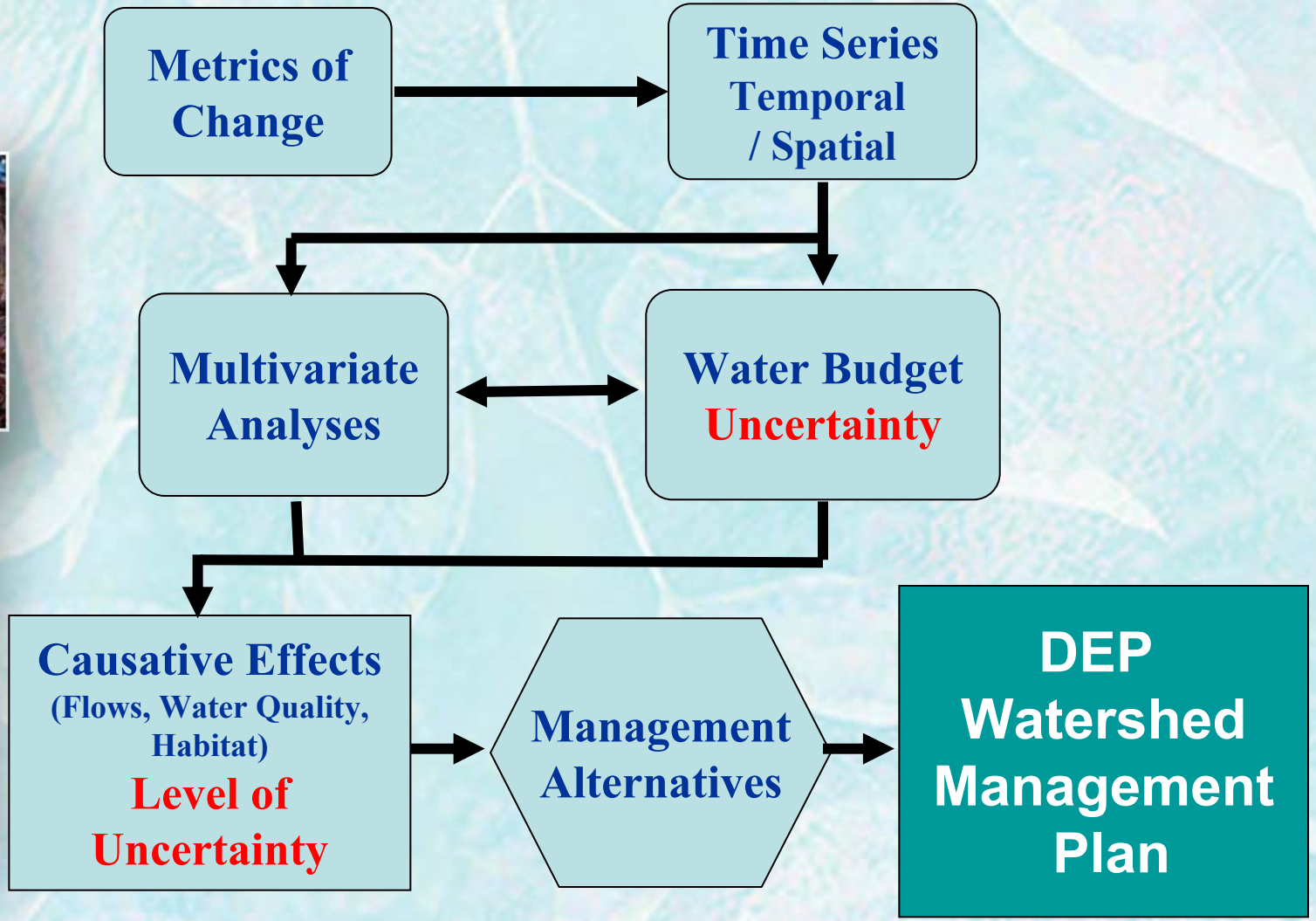
Project Background

- **Study mandated in 2003 by the Florida Legislature**
- **Objective - assess the cumulative impacts of changes in landform and hydrology in the Peace River basin prior to DEP's development of a Watershed Management Plan**
- **Plan Goals - enhance and protect the hydrology and ecology of the Peace River watershed**
  - **Recovery of baseflows and more natural hydrology**
  - **Preservation and restoration of in-stream and floodplain habitats**

Primary Project Objectives

1. Conduct a thorough **analysis of relevant available data** and previous work
2. Use analytical tools to characterize **status and trends** in important watershed parameters
3. Qualify and quantify where possible the **relative effects** of key watershed **stressors**
4. Develop **recommendations** for improved **regulatory framework**

Analytical Approach



Unique Basin Characteristics

- **Bone Valley Formation**
- **Phosphate Mining**
  - Loss of large areas on contributing watershed
  - Loss of streambed and floodplain habitat
  - Reduction in recharge potential
  - Clay settling ponds and gypsum stacks
    - Water quality degradation from spills
    - Increased losses from ET

Unique Basin Characteristics

- **Water quality characteristic**
  - High natural P concentrations
  - Increasing Si and K concentrations
- **Historic artesian springs**
- **Headwater flow diversions due to urbanization**
- **Increasing and more intense agricultural land uses**
  - Rangeland converted to citrus and row crops
  - Agricultural runoff to tributaries

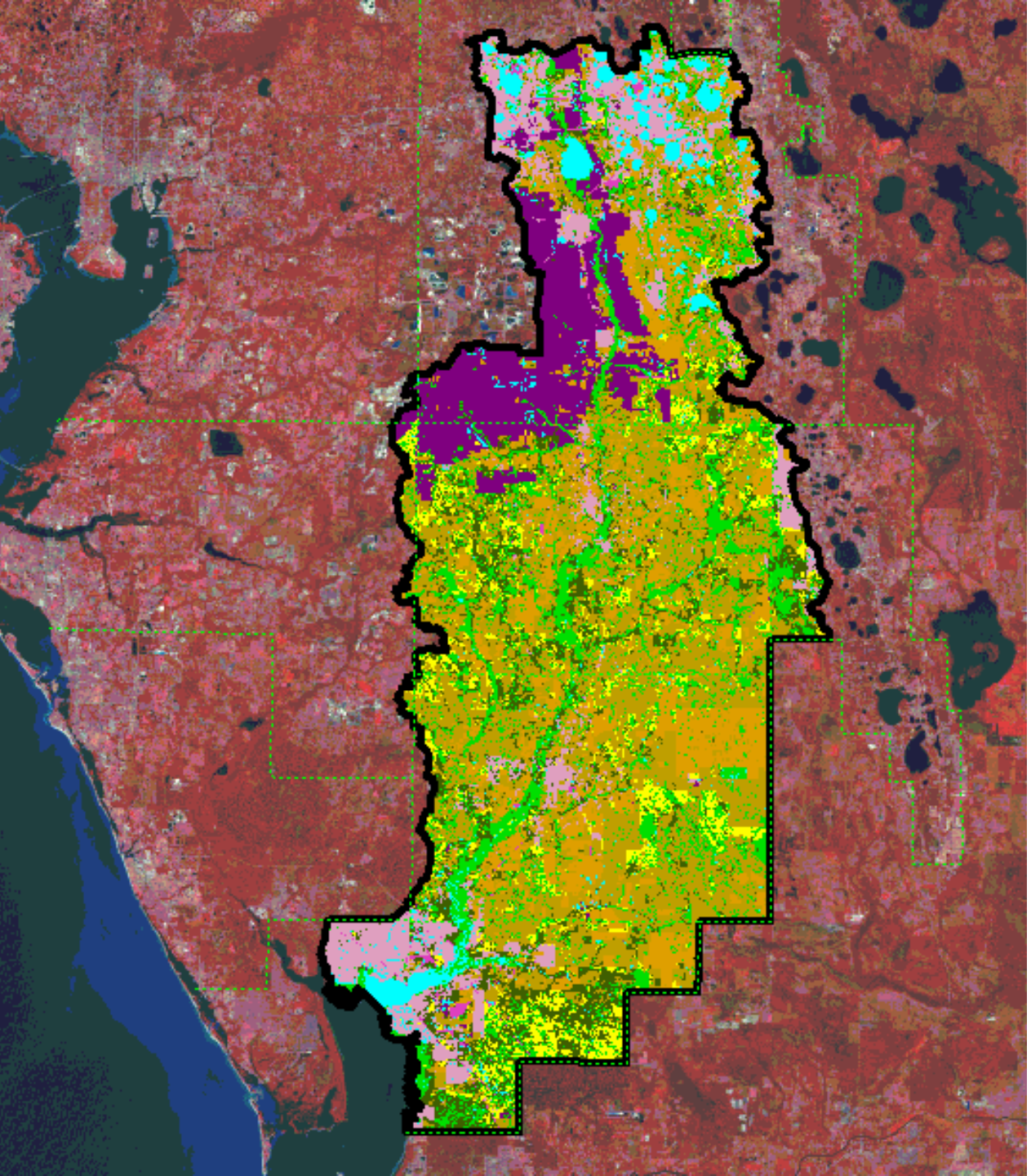
Unique Basin Characteristics

- Reductions in **domestic wastewater** discharges
- Reductions in **mining discharges**
- Major **potable water source** for large and growing population (PRMRWSA)
- **Southern-half** of the basin is the least impacted area of watershed
- Charlotte Harbor Estuary

Key Watershed Stressors

- **Phosphate Mining**
  - Direct habitat loss
  - Loss of contributing drainage area
  - Reduction in recharge potential
- **Agriculture**
  - Increases in baseflow to tributaries
  - Water quality changes
- **Urbanization**
  - Increases impervious surface
  - Increased pollutant loads
- **Groundwater Withdrawals**
  - Combined consumptive uses
- **Long-Term Variation in Rainfall**

Peace River
1999 Land Use

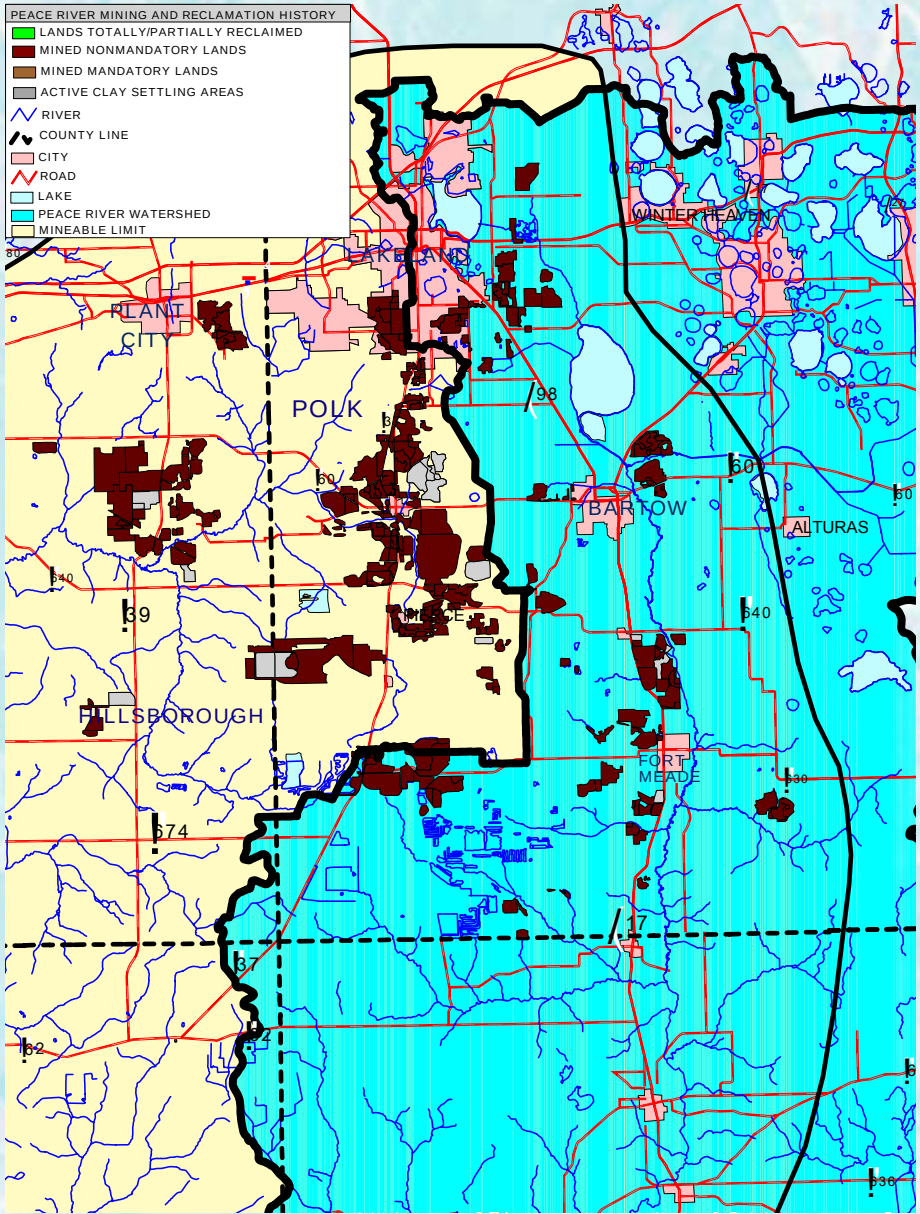


- Urban
- Agriculture
- Rangeland
- Upland Forest
- Water
- Wetlands
- Mining
- Transportation
- Citrus

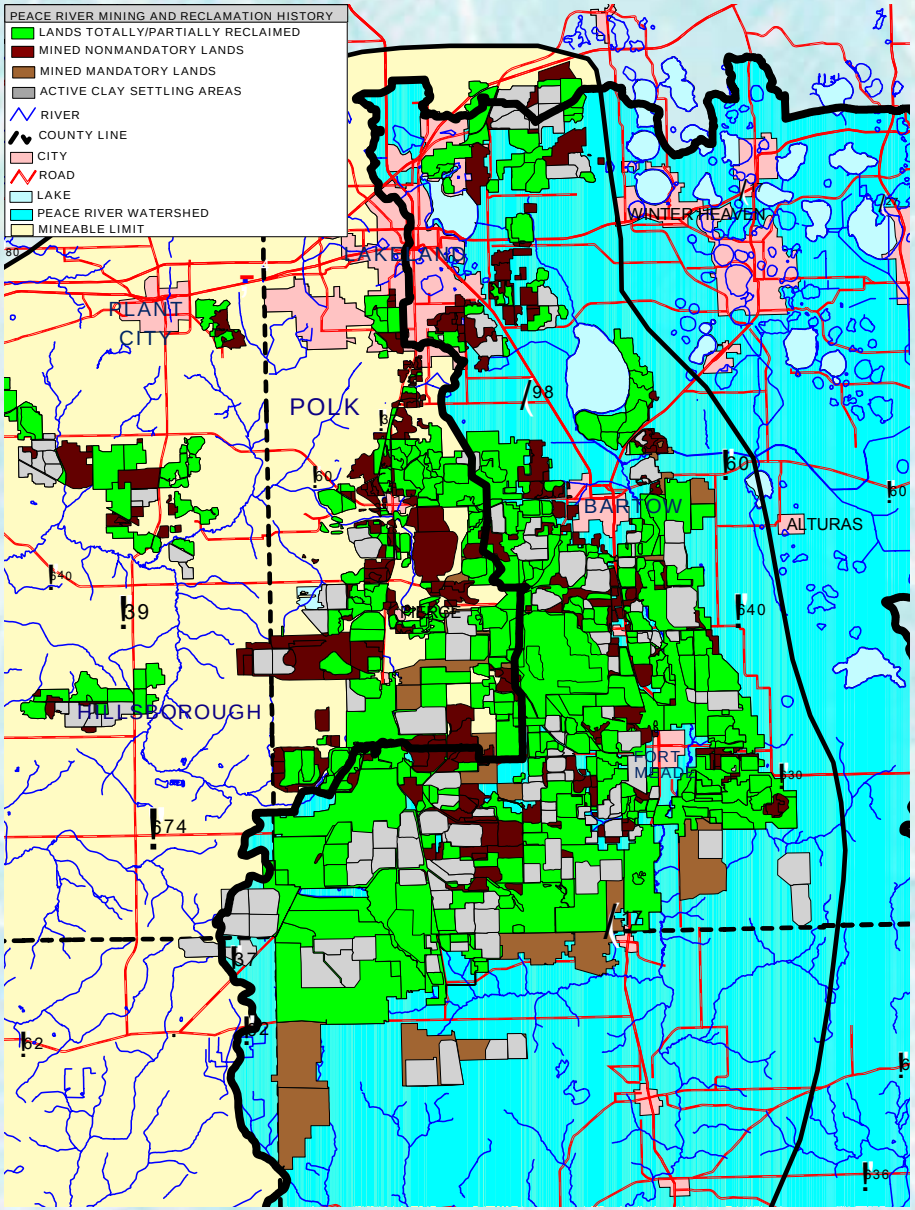
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Basin Characteristics

Phosphate Mining up to 1950



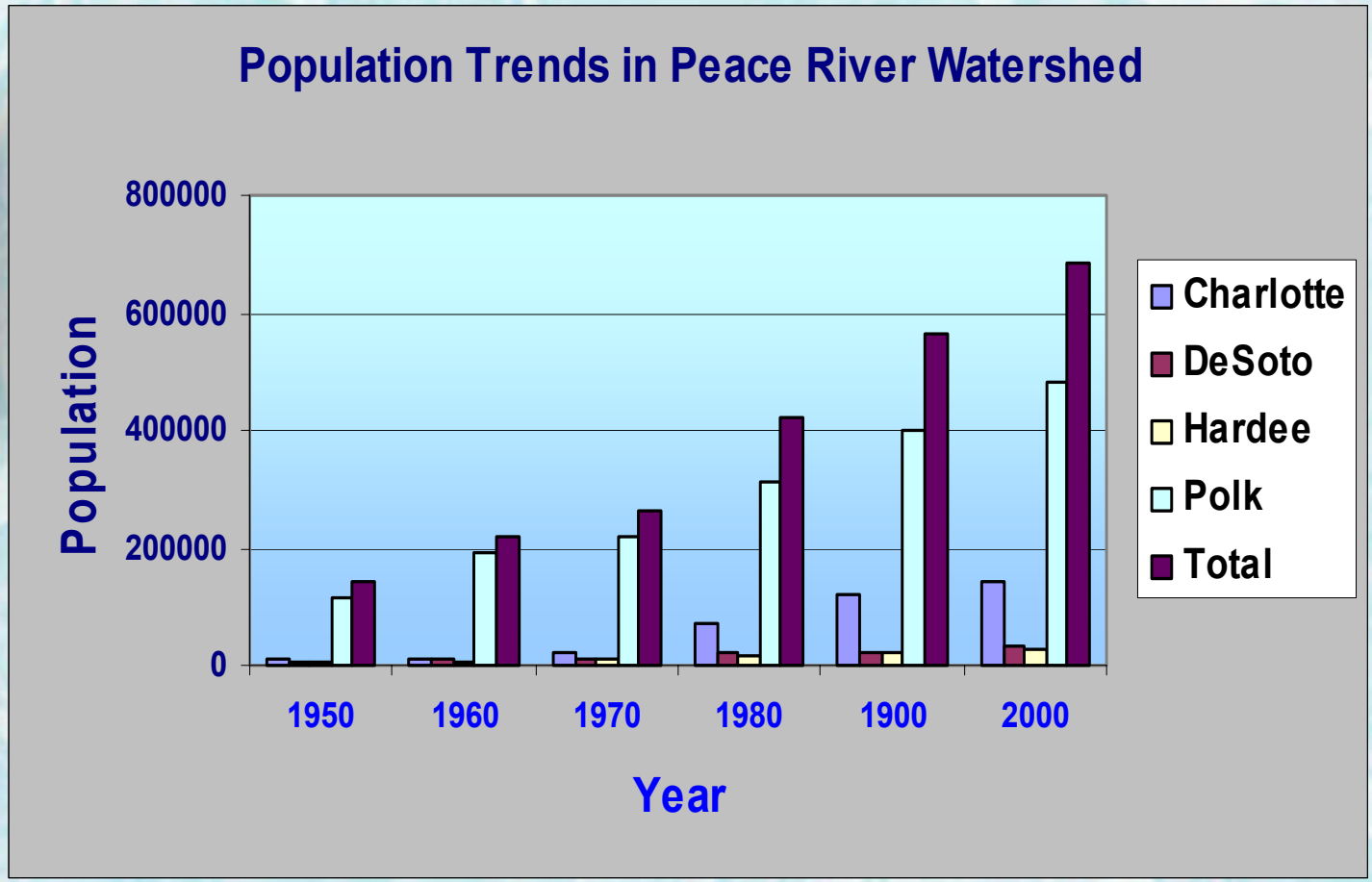
Phosphate Mining through 2000



Approximately 55% Reclaimed

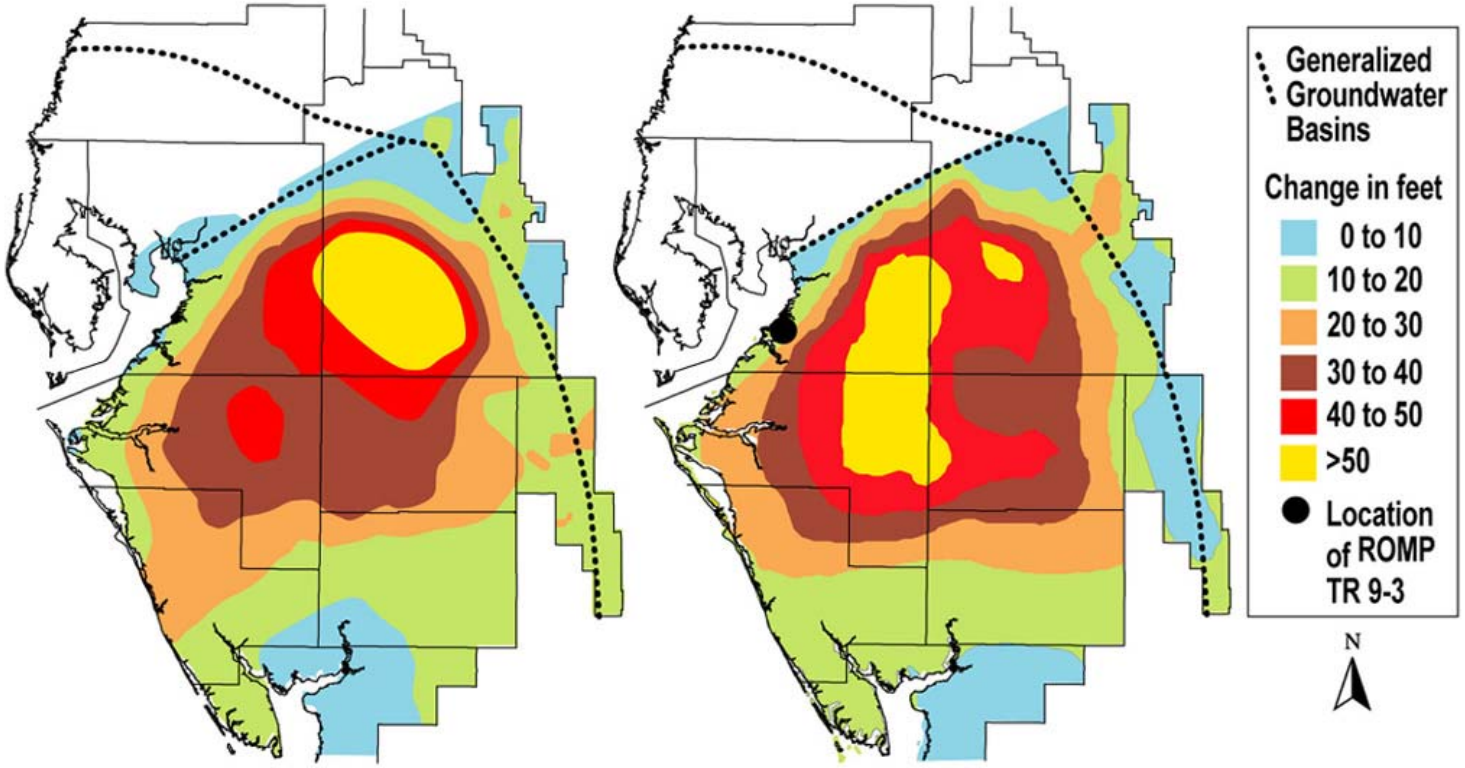
Basin Characteristics

Basin Population Trends



Groundwater Declines

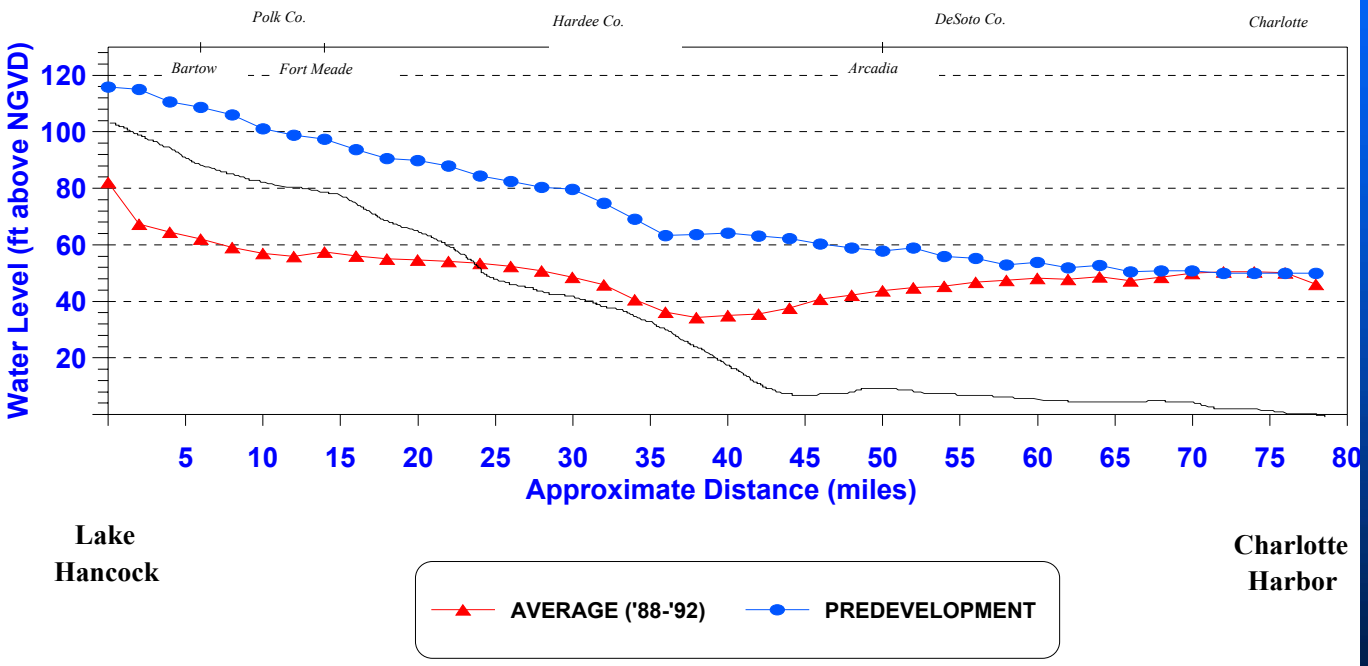
Long Term Changes in the Potentiometric Surface of the Upper Floridan Aquifer



Predevelopment to 1975 **Predevelopment to 2000**

Potentiometric Surface Declines

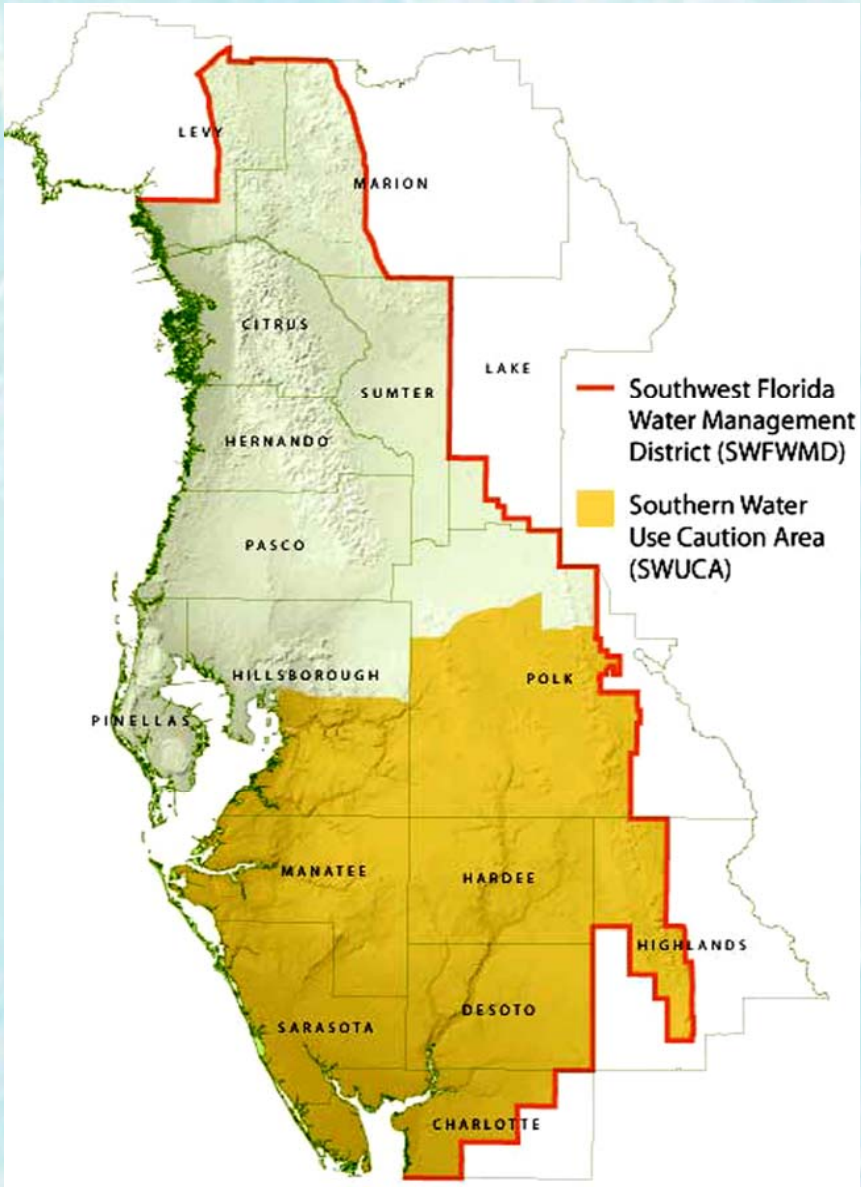
Potentiometric Surface of the Upper Floridan Aquifer along the Peace River



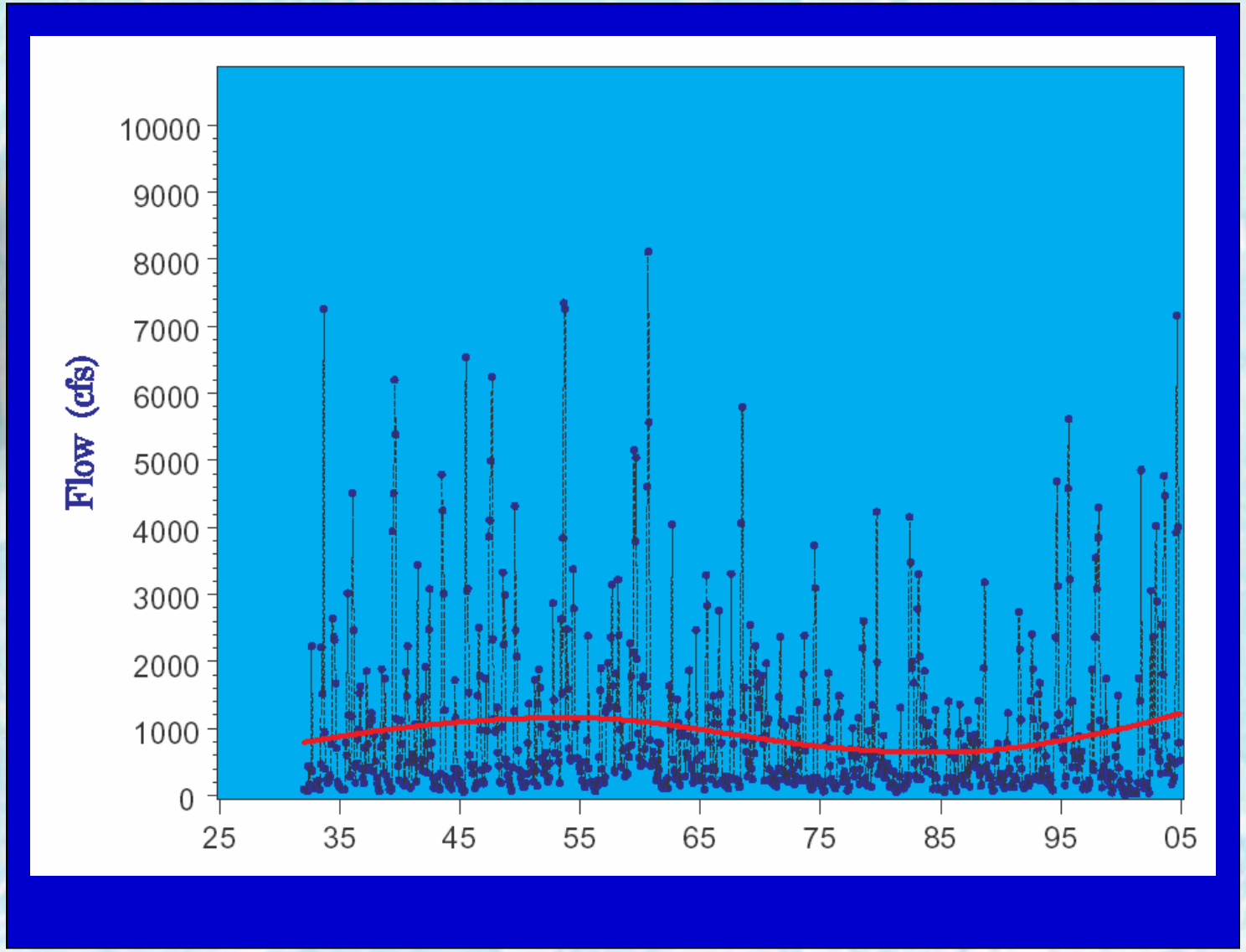
Upper Watershed - Losing River

Southern Water Use Caution Area

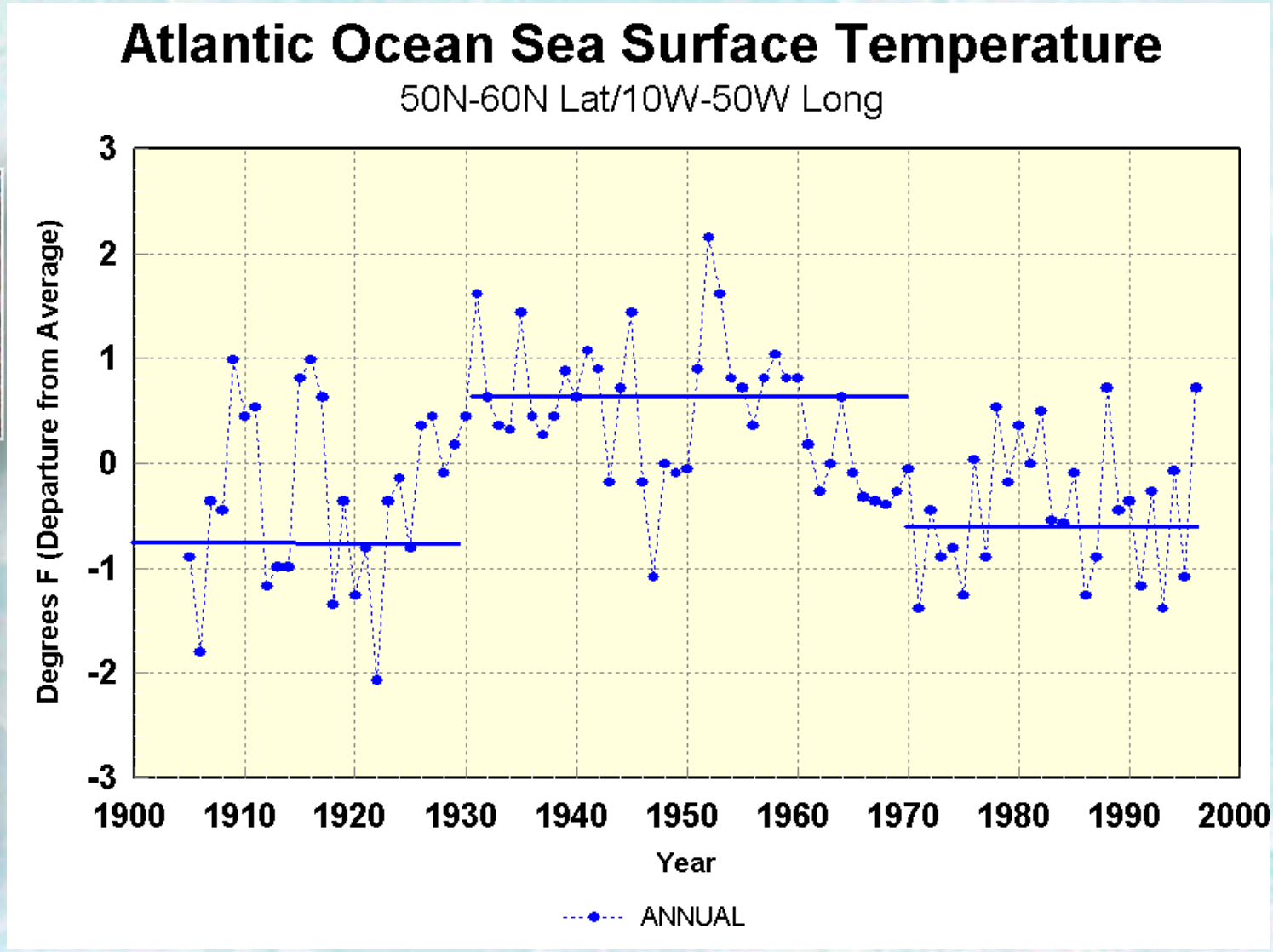
Study area lies wholly within the SWUCA region



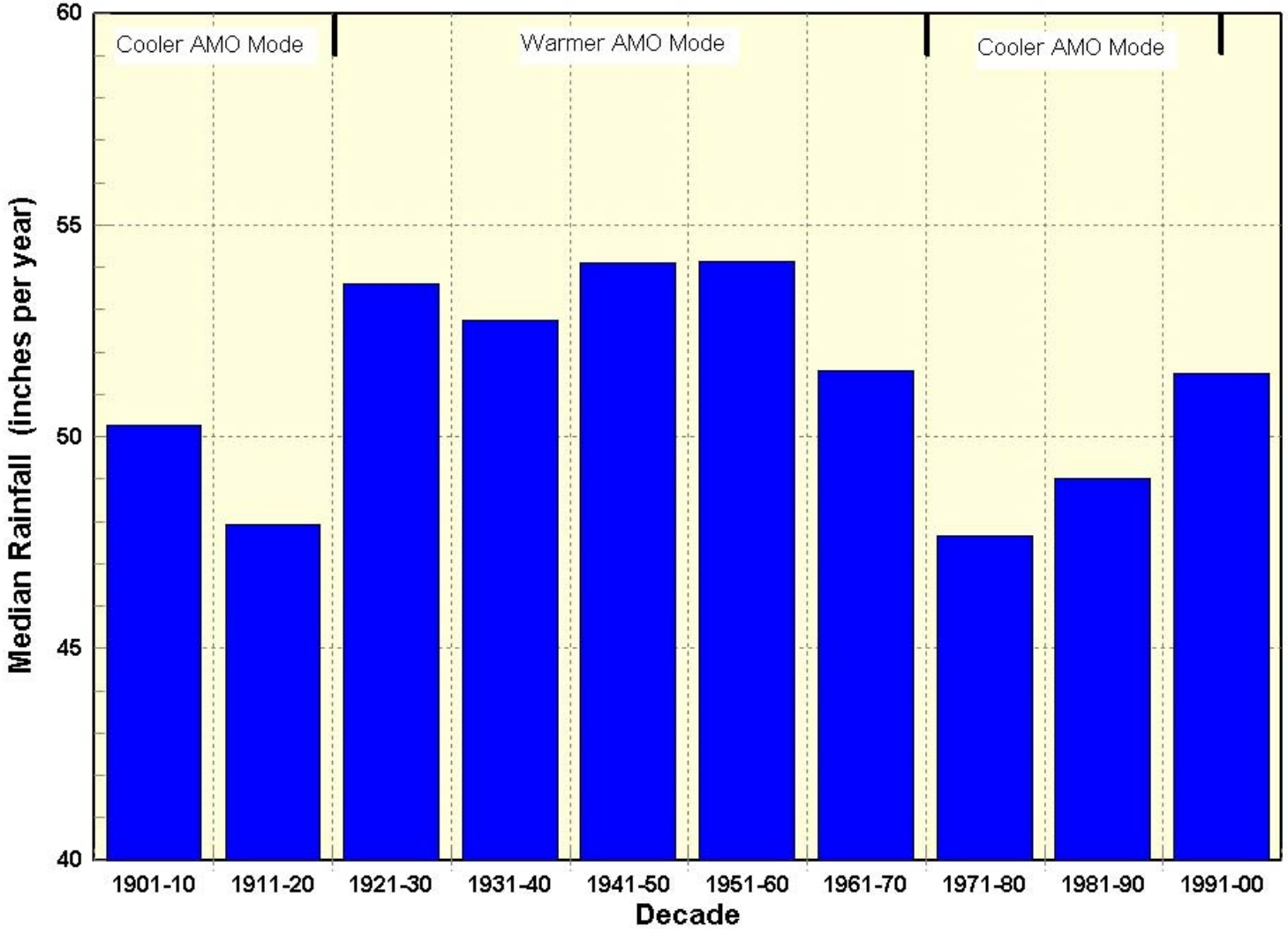
Long-term Hydrologic Patterns



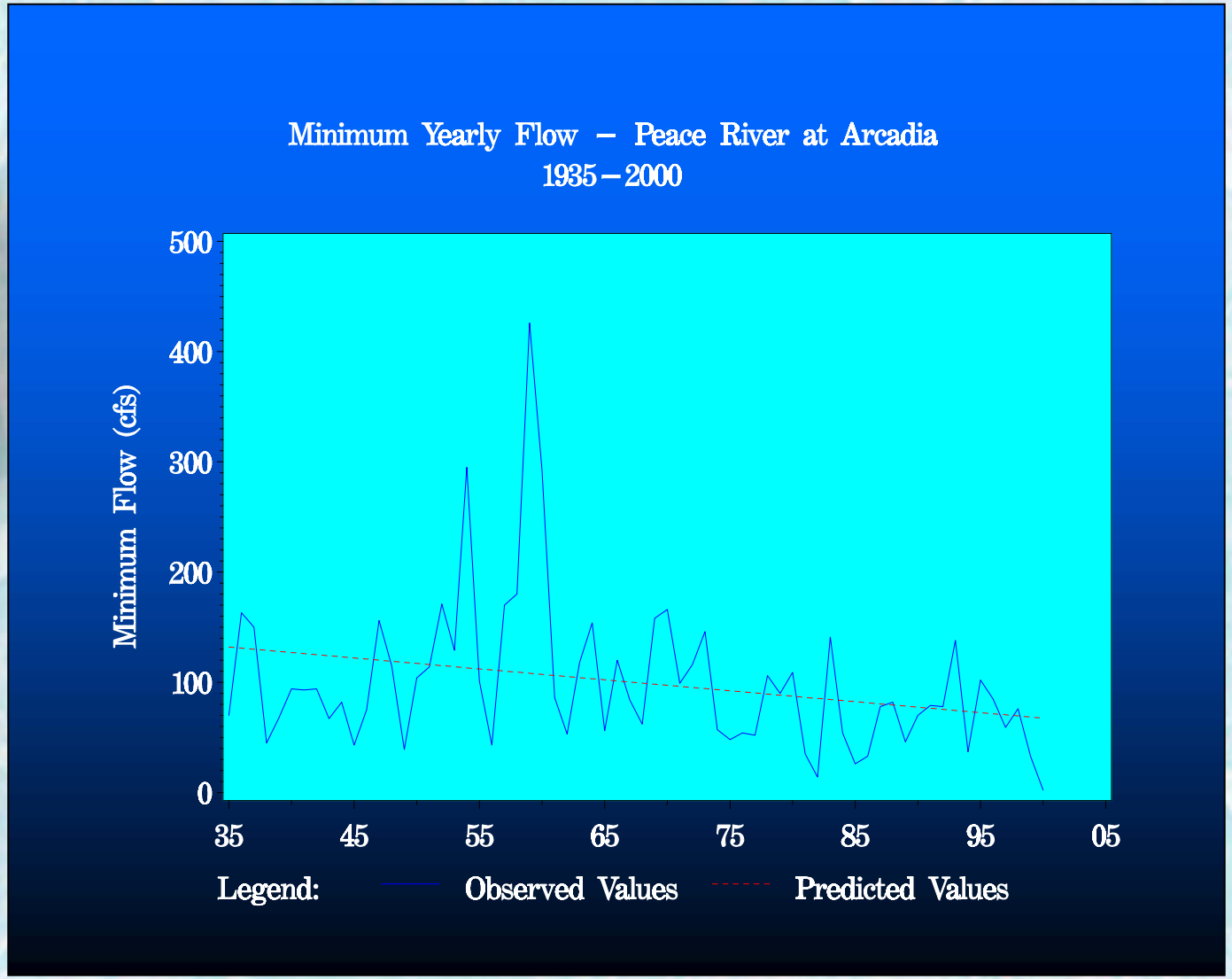
Atlantic Multidecadal Oscillation (AMO)



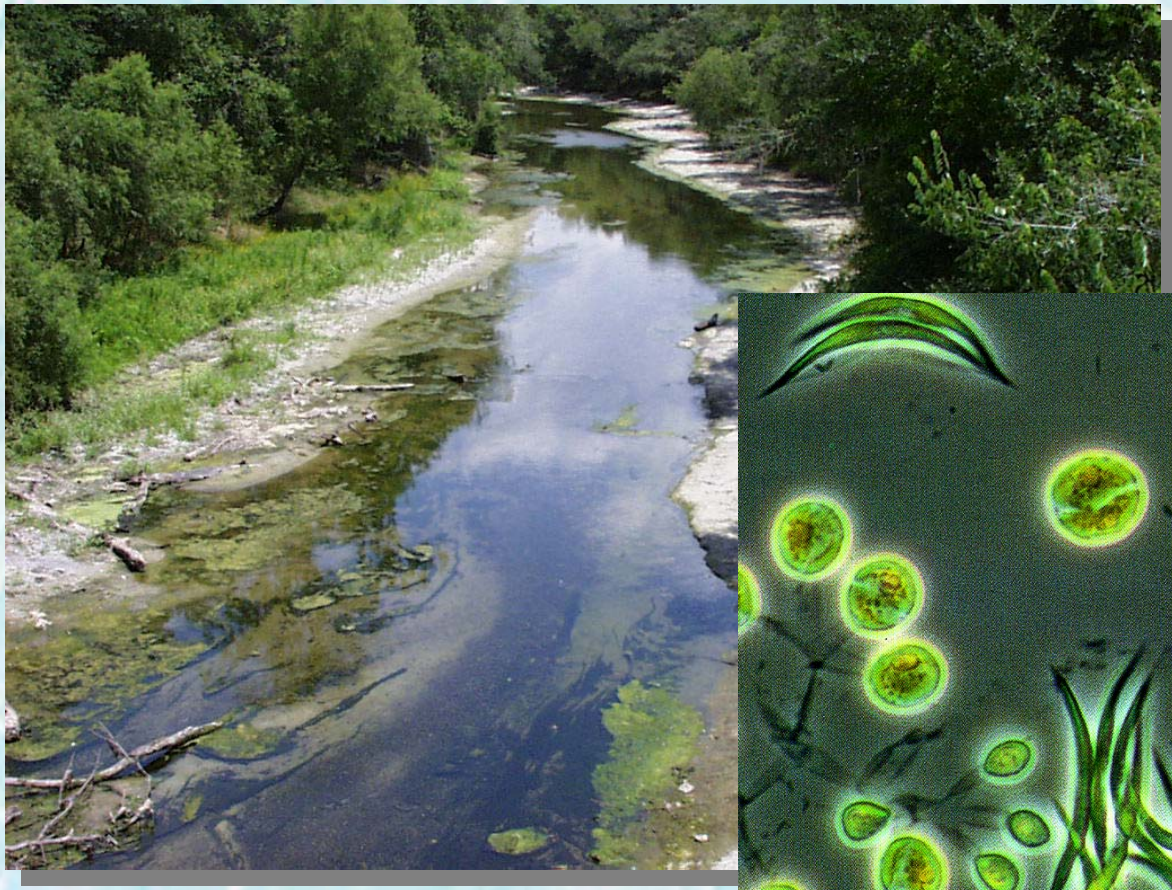
Central Florida Rainfall by Decade



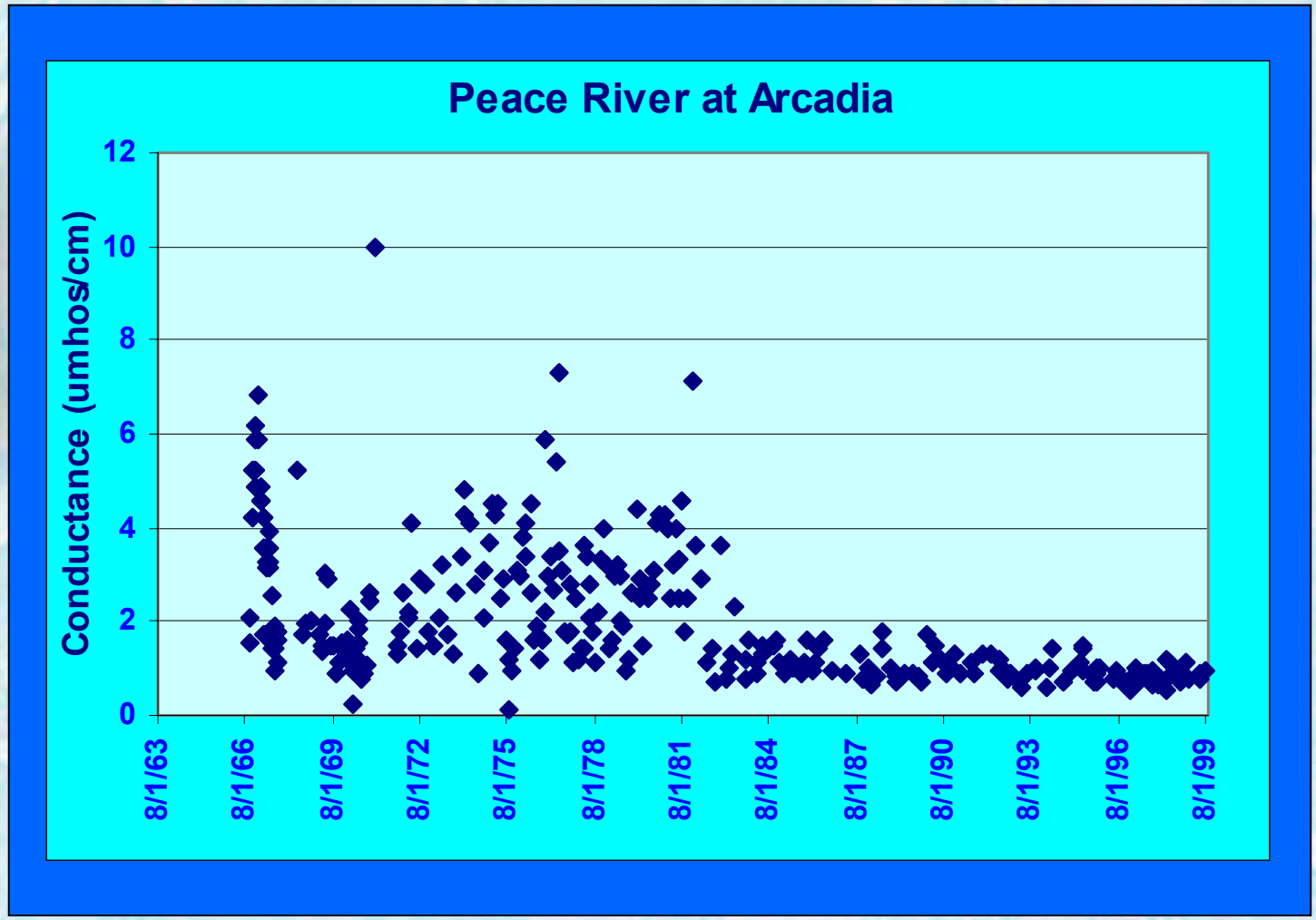
Changes in Flow Percentiles



Changes in Water Quality



Water Quality vs. Time - Conductance



Watershed Stressor and Metrics

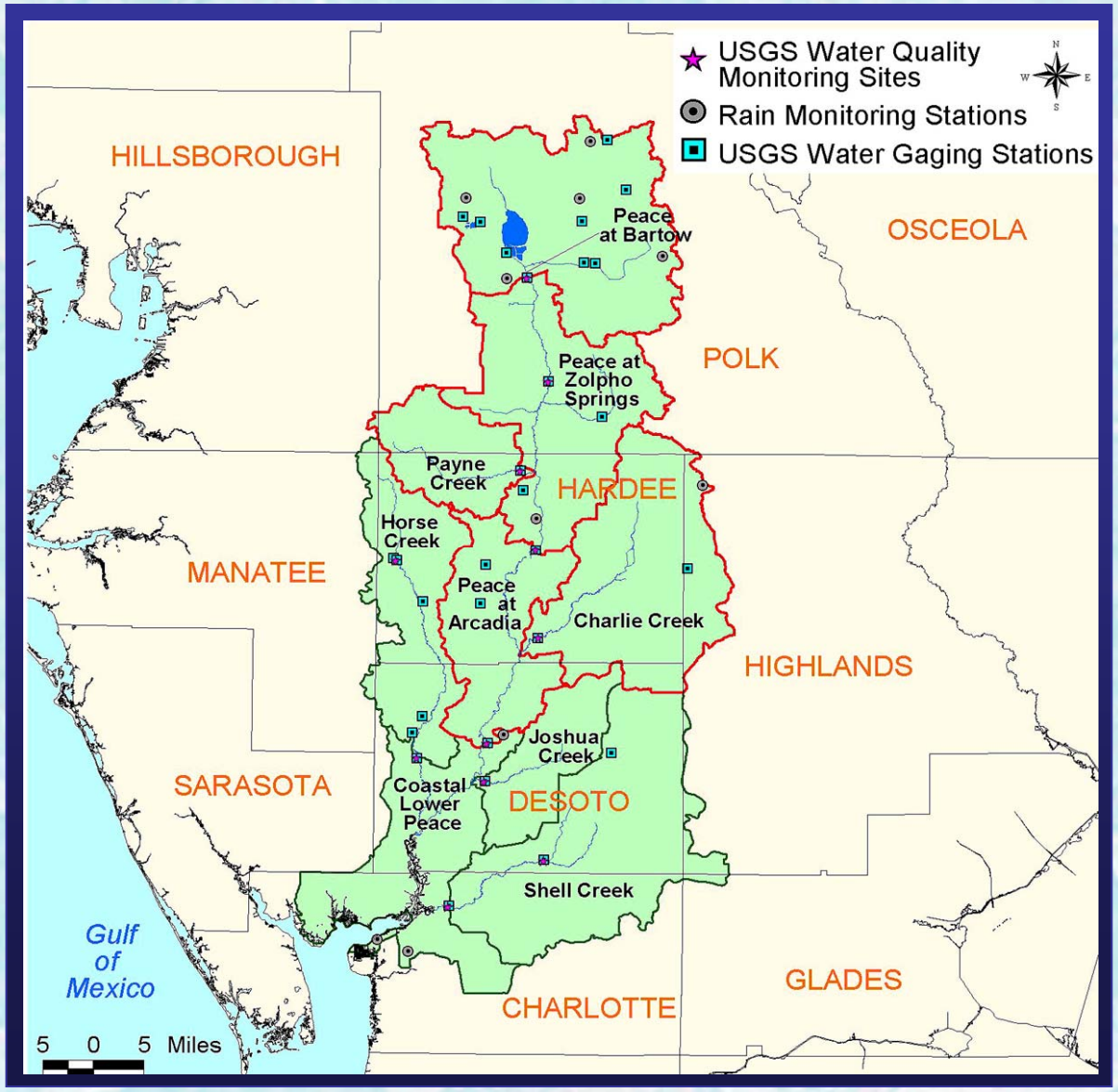
Stressors

- Mining
- Agriculture
- Urbanization
- Climate Change

Metrics

- Streamflow
- Water quality
- Groundwater elevations
- Miles of streambed
- Acres of floodplain
- Acres of wetlands
- Acres of mined lands
- Acres of agricultural lands
- Acres of urban lands

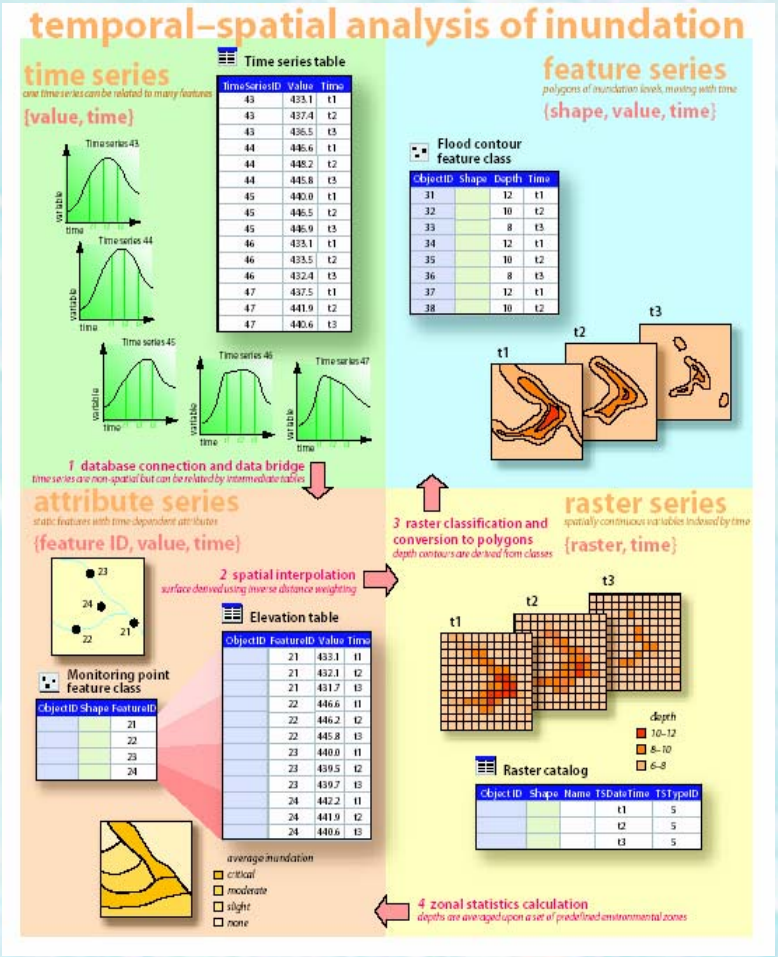
Sub-basin Based Study



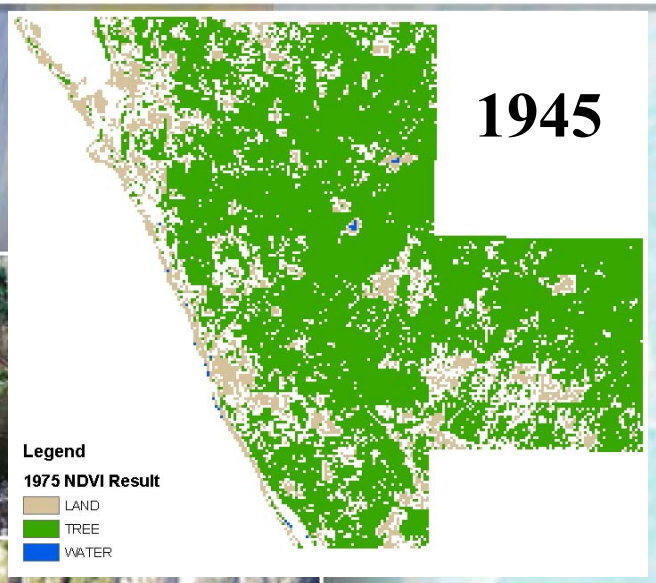
GIS Time Series Analysis Tools

Tools used extensively by PBS&J for watershed time series analysis and modeling

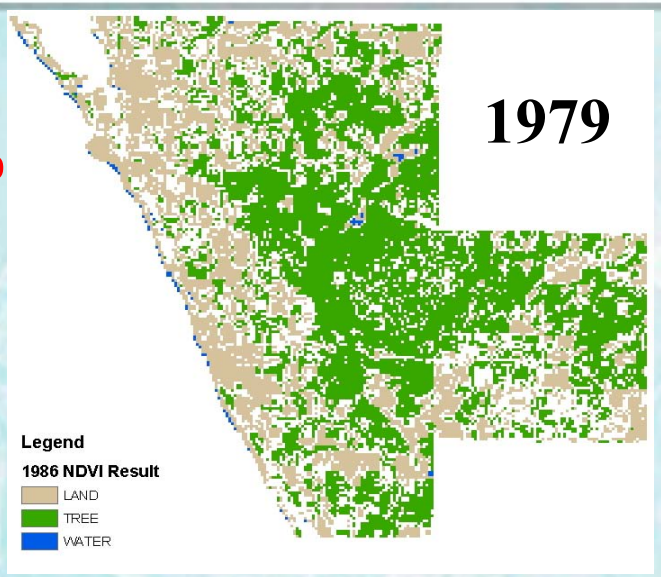
- **ArcGIS 9.0 Time Series**
  - Time series tool for land use, contributing area, etc.
  - Attribute time series for streamflow
- **Spatial Analyst:**
  - Zonal statistics for tracking land use/cover through time.
  - Summary statistics for studying changing relationships through time.
- **Tracking Analyst:**
  - Animates/correlates multiple layers changing through time.



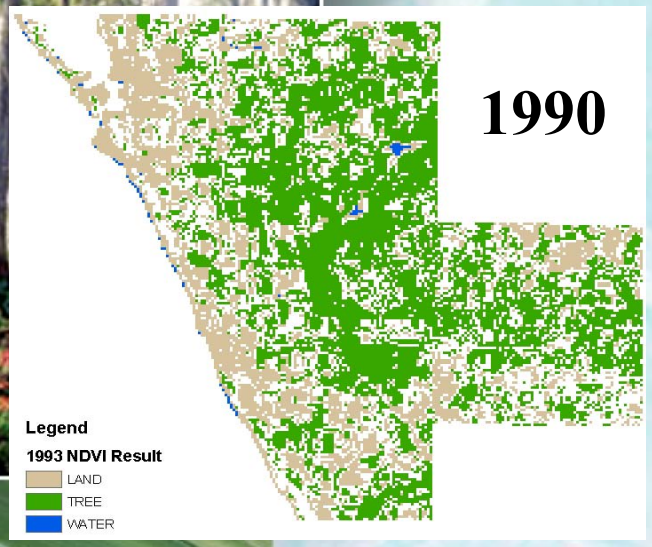
Spatial Analyst Time Series



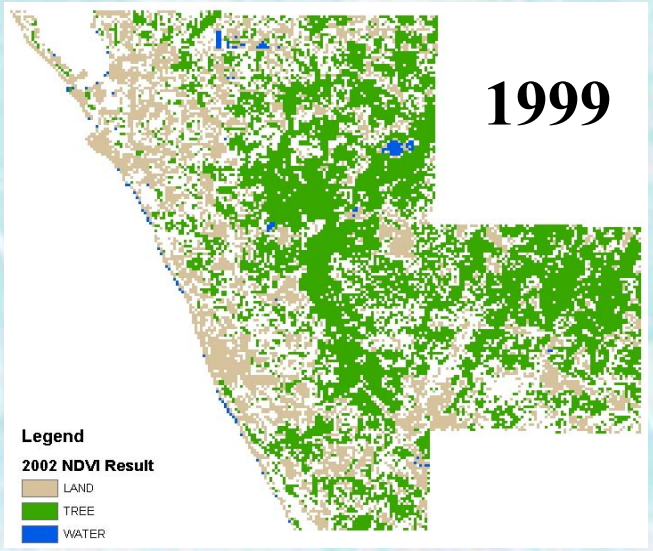
’45 to ’79= -33%



’79 to ’90 = +4%



’90 to ’00 = -4%



Task 1- Literature Review and Data Collection

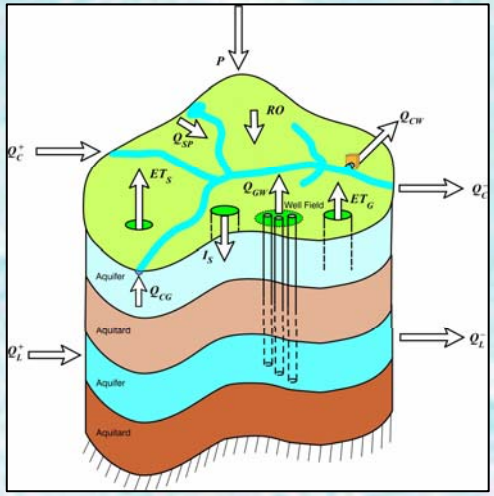
- Collect, check and organize existing information and create **standardized data bases**
- Develop comprehensive Access based **bibliography**
- Use previous and ongoing studies to develop basin specific **conceptual surface and groundwater models**

Task 2 – Description of Historical Changes

- **Time series estimates of subbasin-specific changes in:**
  - Rainfall patterns
  - Streamflow
  - Water quality
  - Point and non-point discharges
  - Drainage alterations
  - Consumptive surface and groundwater uses
  - Land use/habitat
- **Estimate regional changes in groundwater withdrawals**

Task 3 – Identification and Analysis of Factors Causing Changes

- Development of **subbasin-specific water budgets** to differentiate key hydrologic processes
- Effects of **stressors** are not distributed evenly **among** the various **subbasins**
  - Statistical analysis to assess **relative magnitude of changes** in response to watershed stressors



Task 4 – Evaluate Regulatory Effectiveness

- Old mined lands reclamation rules – pre 1975
- New mined lands reclamation rules
- CUP/WUP
- ERP
- CWA Section 404/10
- TMDLs
- Mitigation banking rules

Evaluating Regulatory Effectiveness

1. **Select** and review **indicator** metrics and desired values
   - e.g., miles of streambed
2. Develop a **consensus about gaps** between indicators and desired values
3. Relate **gaps to regulatory programs and authorizations**

Evaluating Regulatory Effectiveness

4. Review **program trends** and how they may be closing gaps

5. Review benefits of **non-regulatory approaches** by resource agencies

6. Draft and test inferences (public involvement) and **develop recommendations**

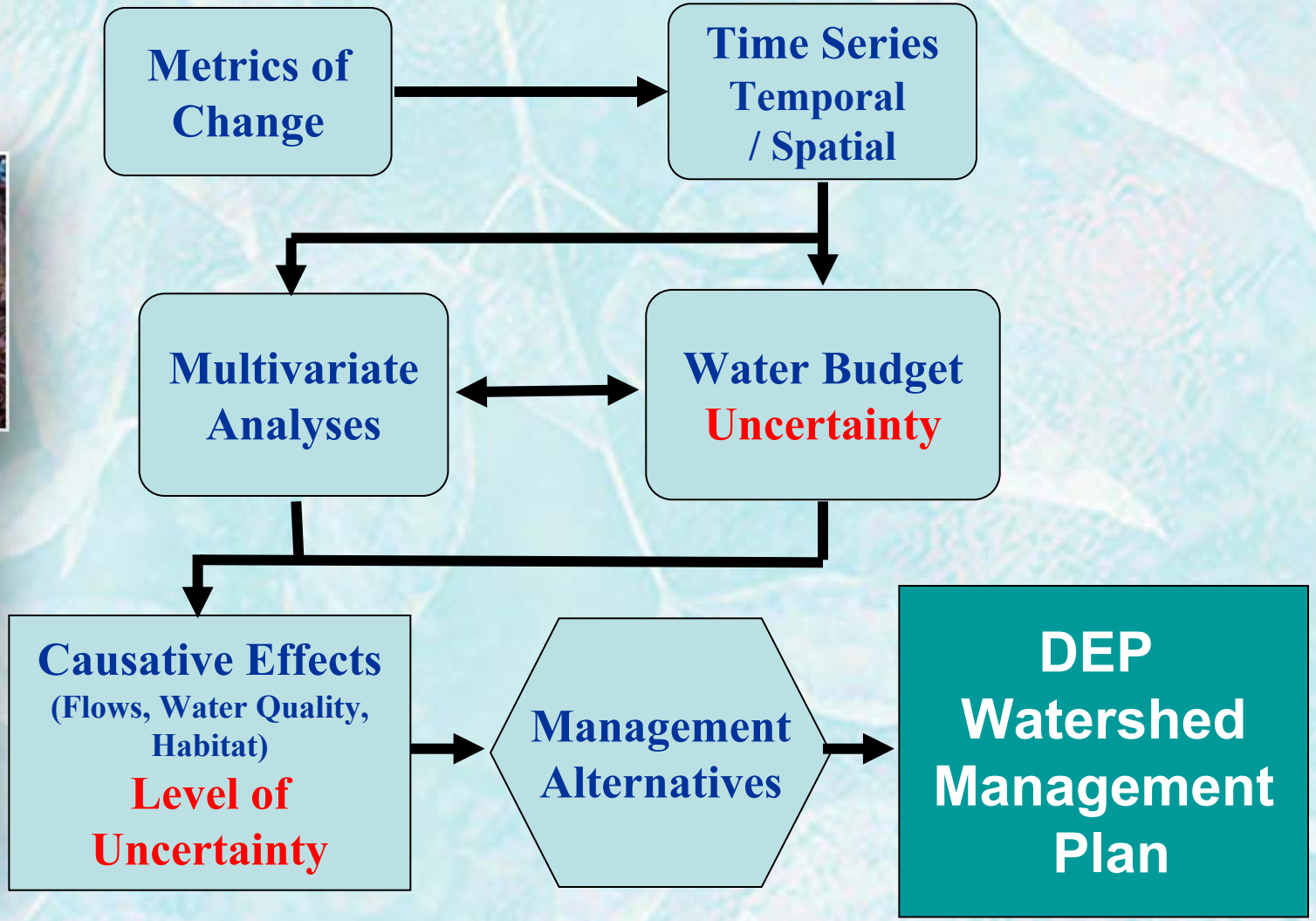
Evaluate Use of Buffers

- **Environmental benefits**
  - **Hydrology**
    - storage and attenuation of peak flows
  - **Water quality**
    - assimilation of sediments and nutrients
  - **Habitat**
    - wildlife corridors and habitat connectivity
  - **Recreation and aesthetics**

Buffers Issues

- **Legal Issues**
  - Review SJRWMD buffer rules on Wekiva and Econlockhatchee Rivers
  - Review legislative authority and make recommendations
- **Economic Impacts**
  - Costs minus benefits = impacts
  - Use of IMPLAN model
  - Calculate buffer value as mitigation using UMAM

Analytical Approach



Task 5 - Public Input

- End of Tasks 1 and 2 – Agency and Stakeholder Workshop
- Task 3 – Technical Workshop of Causal Relationships
- Task 3 – Agency and Stakeholder Workshop on draft Technical Memorandum
- Task 4 – Agency and Stakeholder Workshop on draft Report

Project Timeline

- **Project initiated in January 2005**
- **12 month duration**
- **DEP Management Plan in January 2007**

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