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Managing Regional Water Shortages in the Tampa Bay Area

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Environmental Engineers & Scientists

Presentation Overview

- Background
- Regional water shortage planning needs
- Development of water shortage levels and triggers
- Mitigation actions and communication needs
- Summary and conclusions



Tampa Bay Water Background

- Regional water wholesaler
- Serving six Member Governments
- Historically, one of the fastest growing regions in Florida
- Supplying water to approximately 2.5 million people

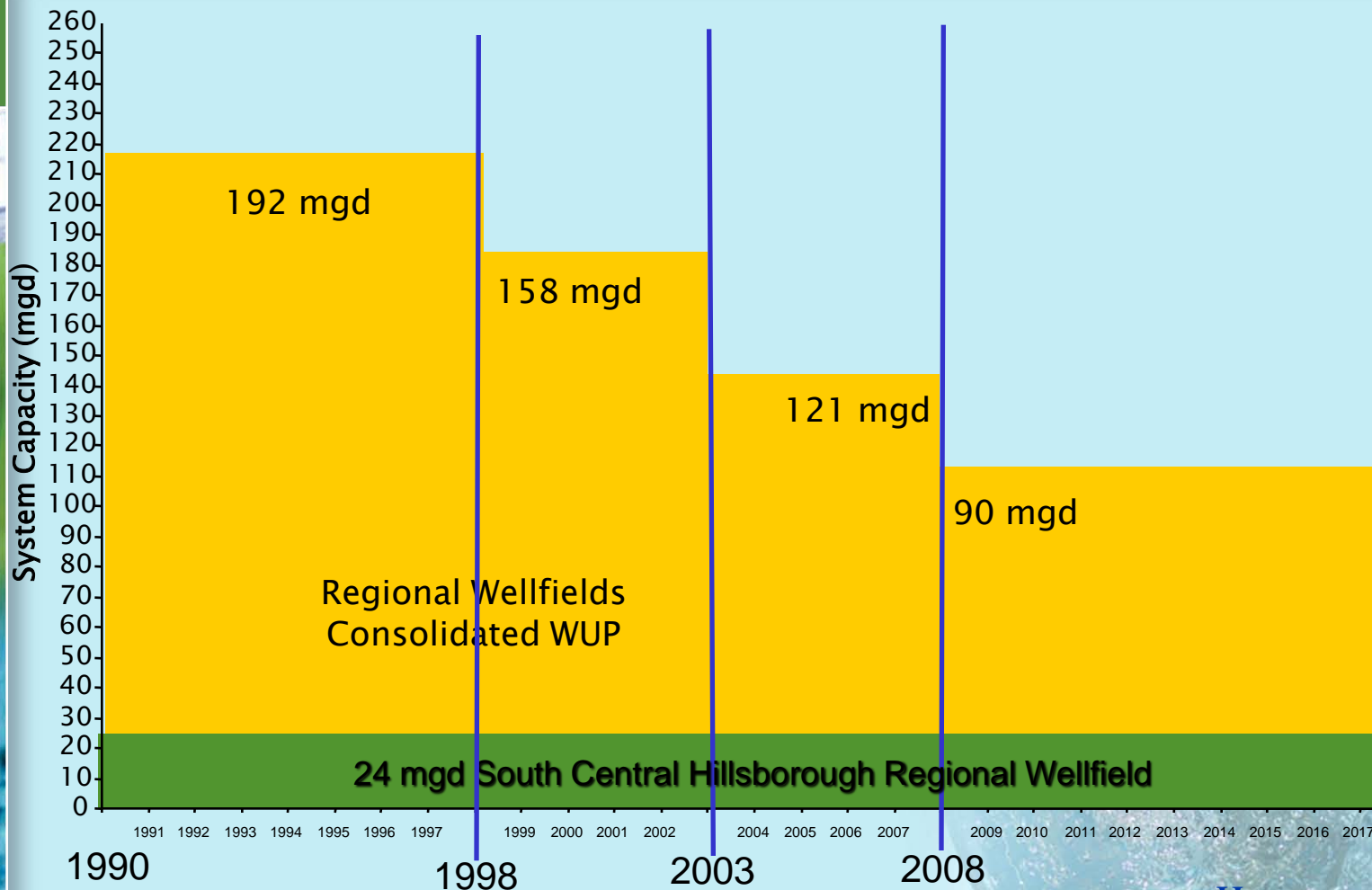


TBW's Changing Supply Sources

- Historically groundwater supply-oriented
- Extensive water supply litigation in 1990's related to environmental degradation
- TBW's Regional wellfield groundwater permits reduced dramatically

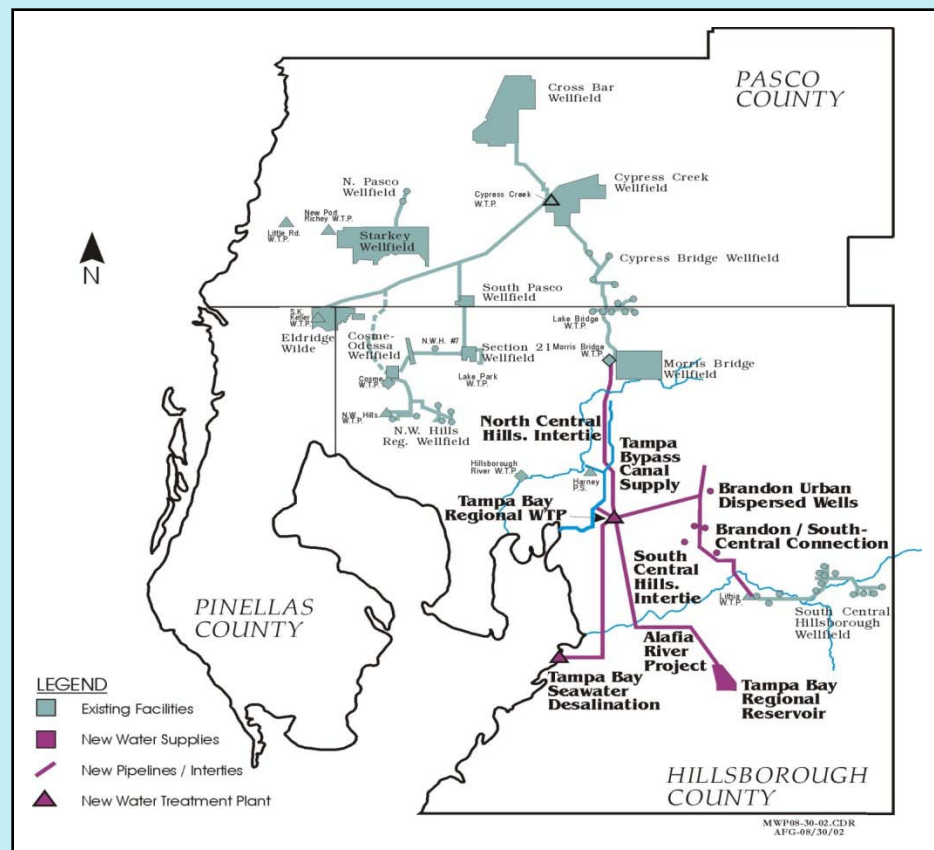


Groundwater Reduction Requirements



New Sources to Replace Groundwater

- Since 1998, >\$650M capital expenditures to maintain capacity
 - Enhanced Surface Water System (ESWS)
 - Desalination



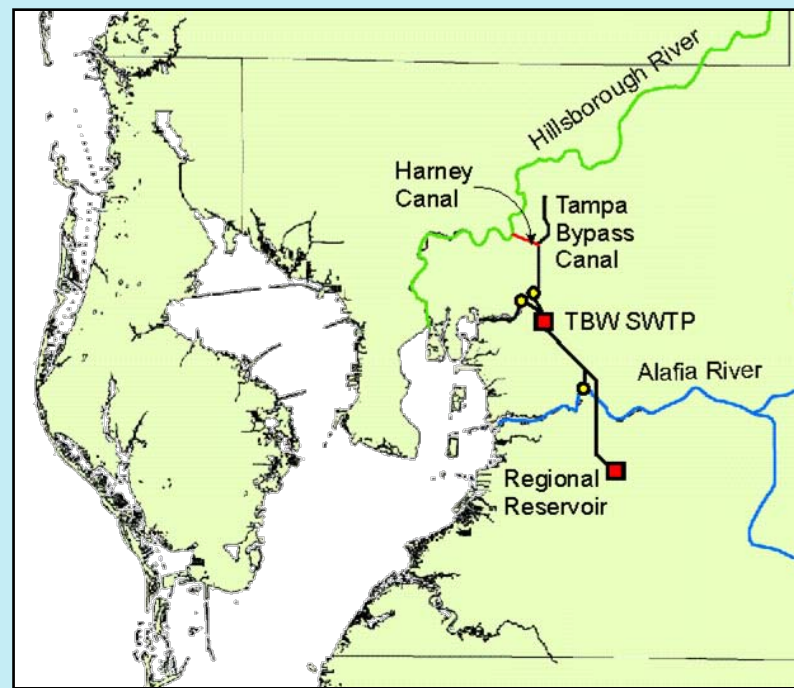


Tampa Bay Water Regional Water Shortage Planning Needs

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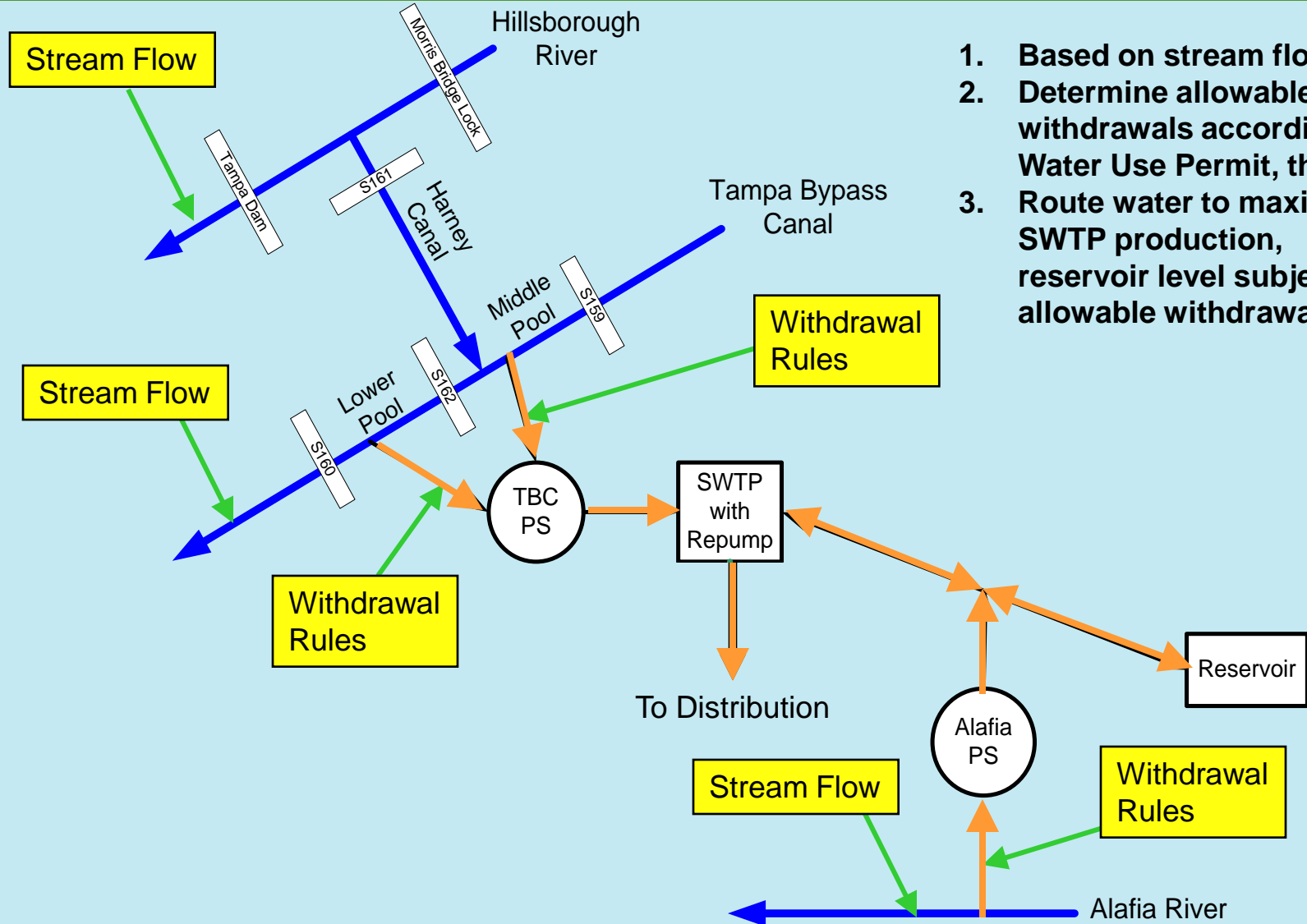
Enhanced Surface Water System

- 66-mgd Surface Water Treatment Plant (SWTP)
- 15-billion gallon off-stream reservoir
- 3 stream sources
 - Tampa Bypass Canal
 - Hillsborough River
 - Alafia River
- Water Use Permit
 - withdrawals = % flow
 - supply depends on weather



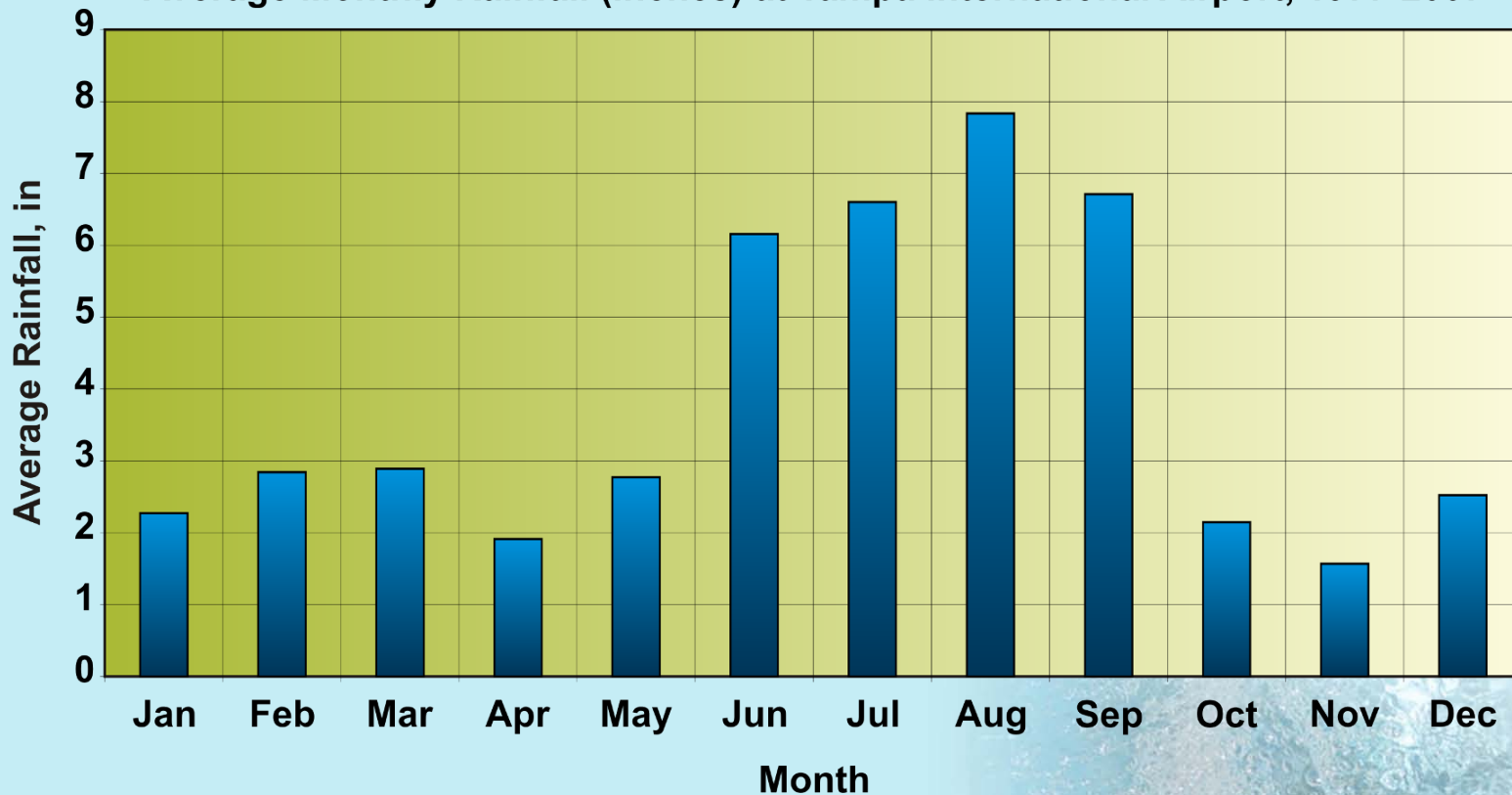
Enhanced Surface Water System (ESWS) Model

1. Based on stream flows...
2. Determine allowable withdrawals according to Water Use Permit, then...
3. Route water to maximize SWTP production, reservoir level subject to allowable withdrawals



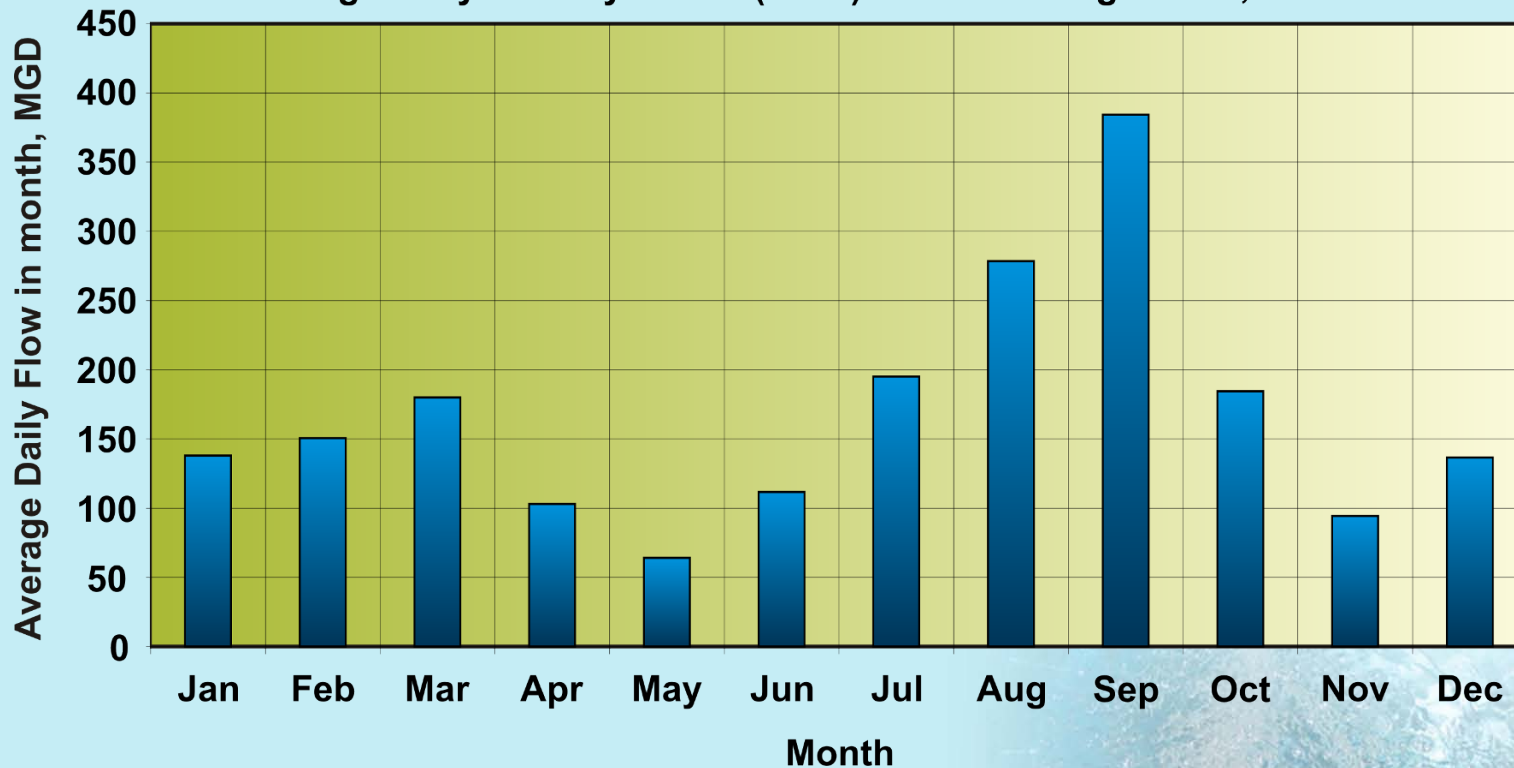
Heavy Seasonality in Precipitation

Average Monthly Rainfall (Inches) at Tampa International Airport, 1977-2007



Heavy Seasonality in Source Flows

Average Daily Flow by Month (MGD) in Hillsborough River, 1972-2006



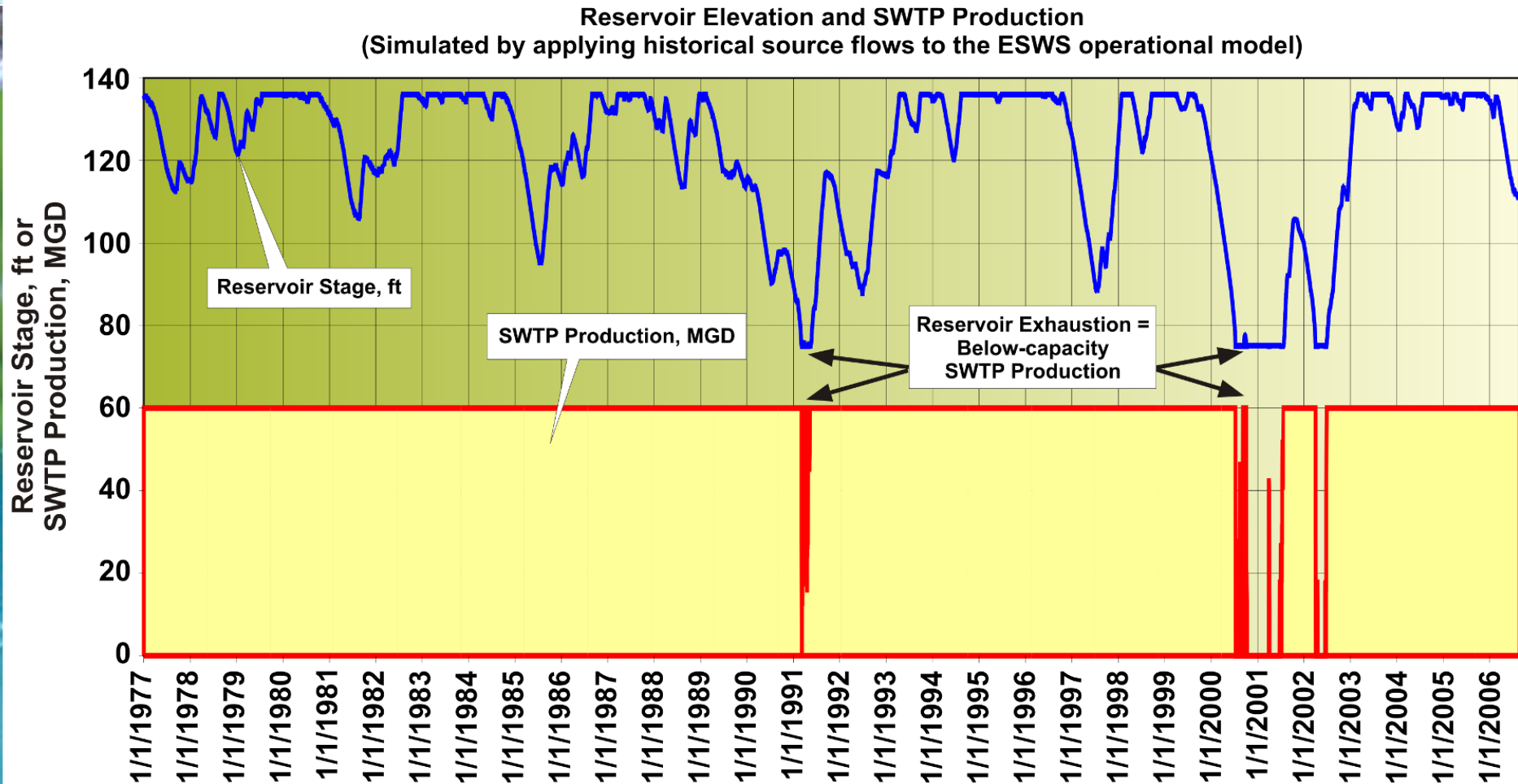
Drought Impacts on ESWS

- Droughts occur periodically
 - Lower-than-normal rainfall in summers, exceptionally dry subsequent periods
- Sustained drought can exhaust reservoir
 - Flows in streams are then insufficient to maximize SWTP production
 - Increased GW reliance becomes necessary
 - Increased risk of violating GW permits



Drought Impacts on ESWS

- Exhaustion would have happened in the past



Drought Impacts on ESWS

- Sustained drought can exhaust reservoir



At Capacity, November 2005



Nearly Empty Due to Drought, 2009



Trigger and Phase Development/Selection

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WSMP Objectives

- Develop four water shortage phases consistent with SWFWMD Water Shortage Plan 40D-21 rule requirement
- Define hydrologic triggers to enter and exit each water shortage phase
- Link water shortage phases to conditions corresponding to high risk of surface water supply exhaustion
- Define public communication and water shortage mitigation activities to moderate demand and reduce risk of surface water exhaustion

Supply Reliability Indicators

- Cumulative local rainfall and supply stream deficits
 - departure from normal seasonality
 - e.g. 6-, 12-, 24-month cumulative rainfall deficit
- Reservoir elevation
 - Shortage imminent when elevation is low while flow deficits are high



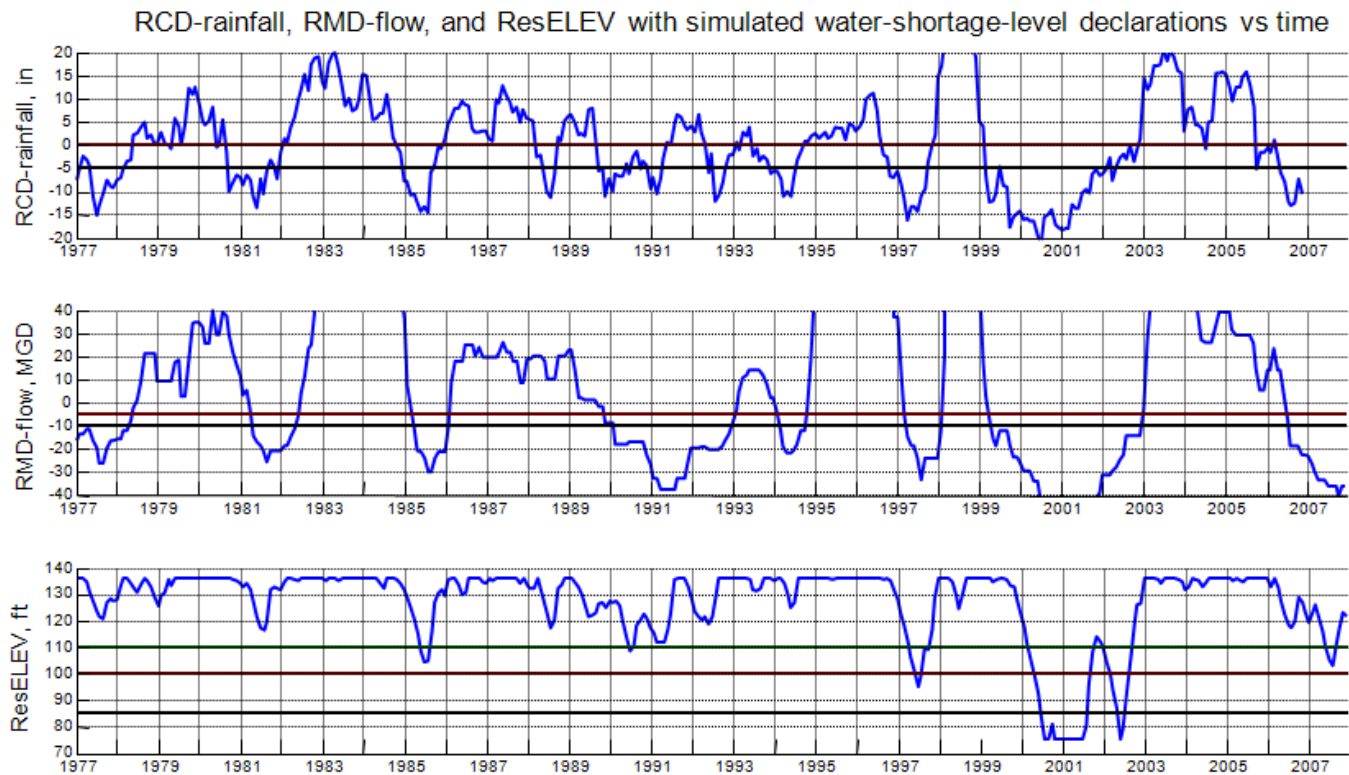
Selected Hydrologic Criteria

| Criterion | Description |
|--------------|---|
| RCD-Rainfall | 12-month rolling cumulative rainfall deficit |
| RMD-Flow | 12-month rolling median streamflow deficit |
| ResELEV | Reservoir elevation corresponding to remaining days of supply |



Trigger Analyses

- Simulated full ESWS operation
- Charted various indicator values
- Noted indicator values that reliably precede shortage



Trigger Objectives

- Phase 1: Reduced rainfall or stream flow, potential for water supply shortage
- Phase 2: Reduced rainfall and stream flow translates to storage consumption: reservoir level adequate but decreasing
- Phase 3: Reduced system reliability with substantial, protracted storage loss
- Phase 4: Extremely low reservoir, system shutdown imminent

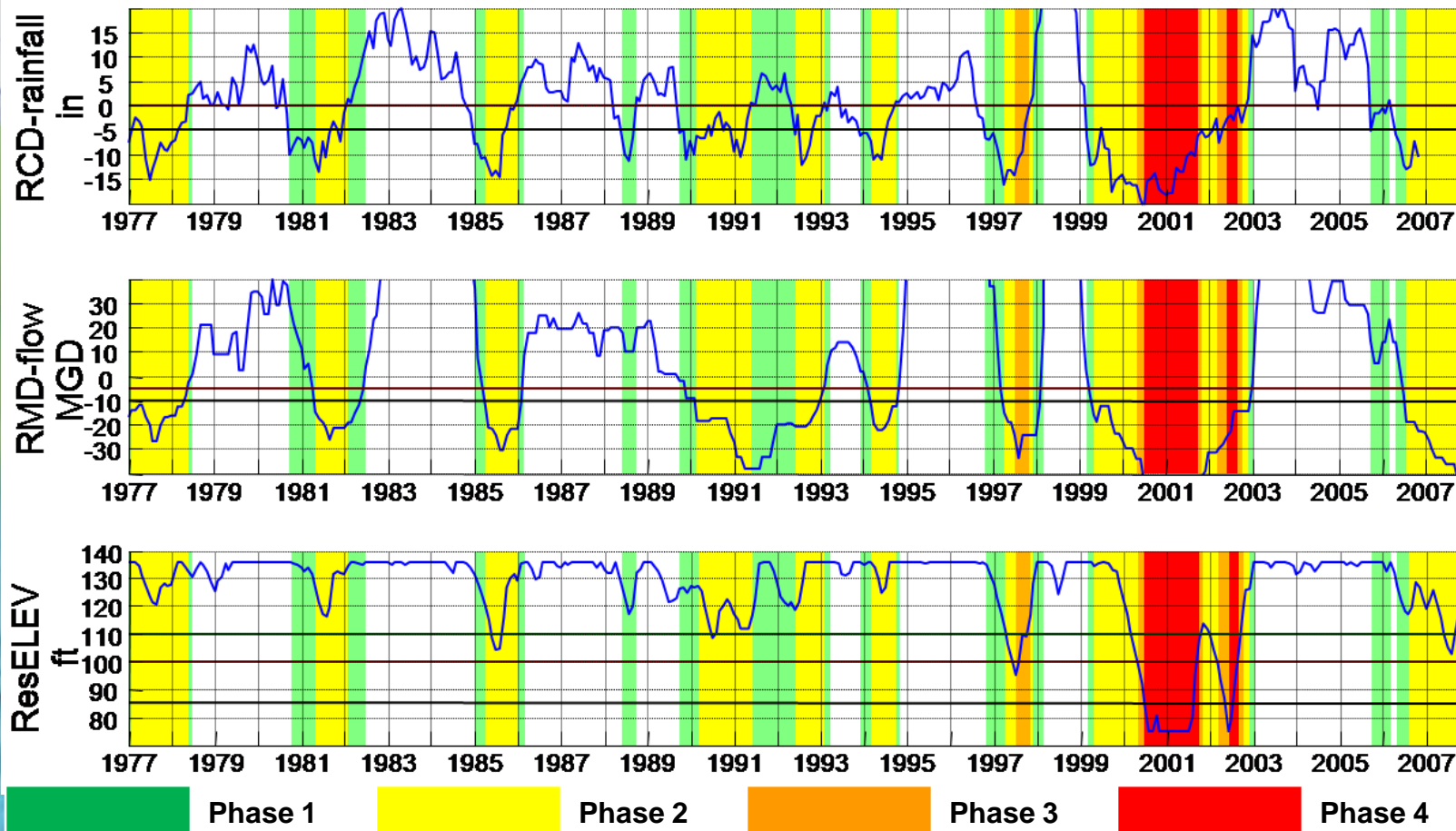


Selected Triggers

| Water Shortage Phases | Triggers | |
|--------------------------------------|--|---|
| | Enter | Exit |
| I. Drought Alert | RCD Rainfall < -5" OR RMD Flow < - 10 mgd | No RCD Rainfall AND RMD Flow > - 5 mgd |
| II. Drought Warning | RCD Rainfall < -5" AND RMD Flow < - 10 mgd | No RCD Rainfall OR RMD Flow > - 5 mgd |
| III. Regional Supply Shortage | RMD Flow < -10 mgd AND Reservoir Level drops below 100' elevation | RMD Flow > - 5 mgd OR Reservoir Level moves above 110' Elevation |
| IV. Water Supply Crisis | RMD Flow < - 10 mgd AND Reservoir Level drops below 85' elevation | RMD Flow > - 5 mgd OR Reservoir Level moves above 100' Elevation |

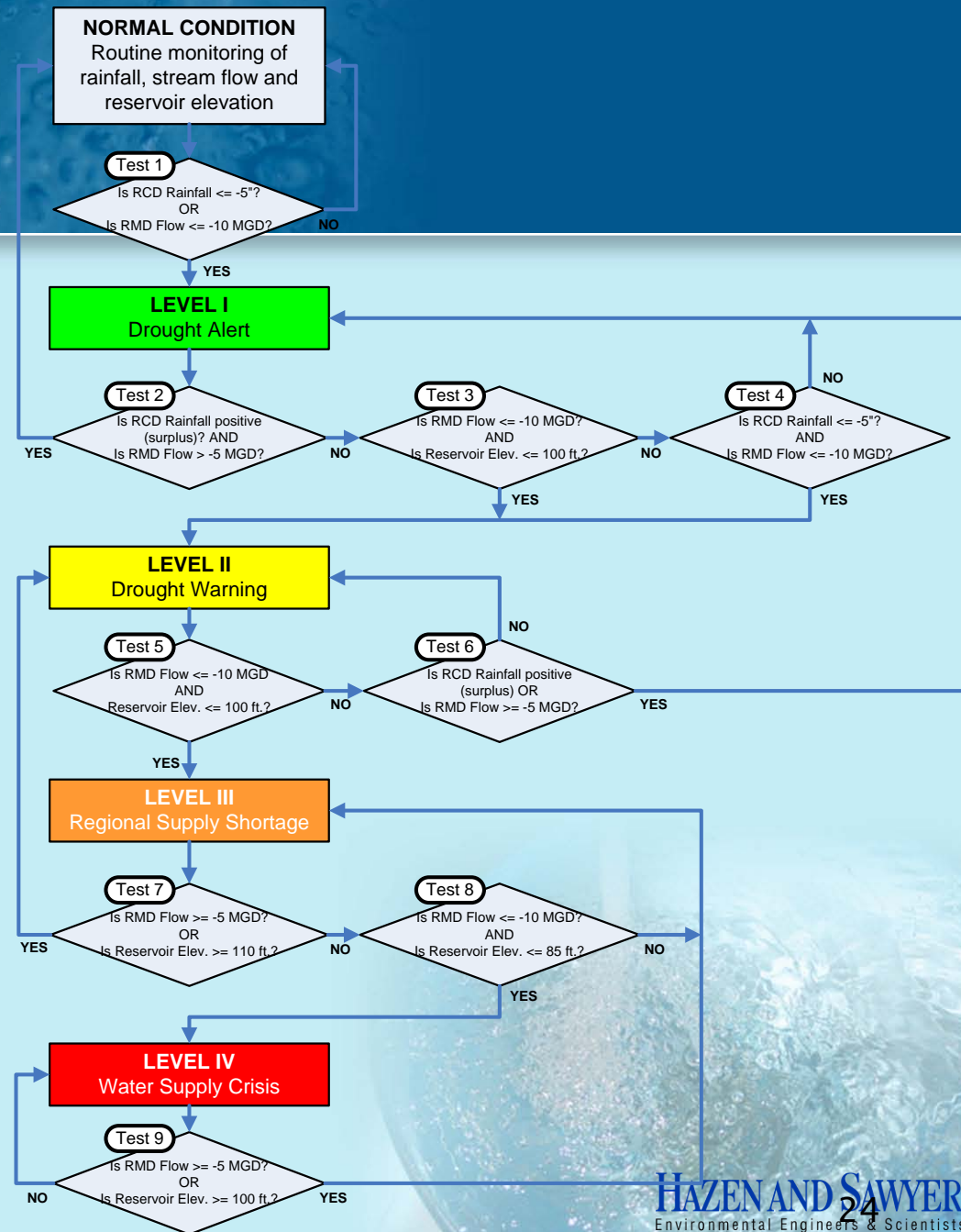
Historical Simulation of Triggers

RCD-rainfall, RMD-flow, ResELEV w/ simulated water shortage phase declarations vs. time



WSMP Decision Procedure

- WSMP triggers evaluated in a structured procedure
- Water shortage phase determined on the 1st of each month
- Takes the subjectivity out of declaring shortages





Mitigation Actions, Implementation and Communication Needs

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Management Activities

- Supply Management
 - Provide extra surface water
 - Maximally reserve of GW
- Demand Management
 - Moderate water demands
 - Reduce GW need, generate permit flexibility
- Goals
 - Increase supply reliability
 - Minimize potential for increased GW use
 - When increased GW is necessary, it is maximally justified

Supply Management Activities

- No supply management in Phases 1 and 2
 - Low flows and rainfall
 - Storage not yet severely compromised
- Supply management in Phases 3 and 4
 - Maximize surface water use to reserve groundwater
 - Relax surface water permit limits
 - Prepare justification for relaxing groundwater permit limits as a last resort



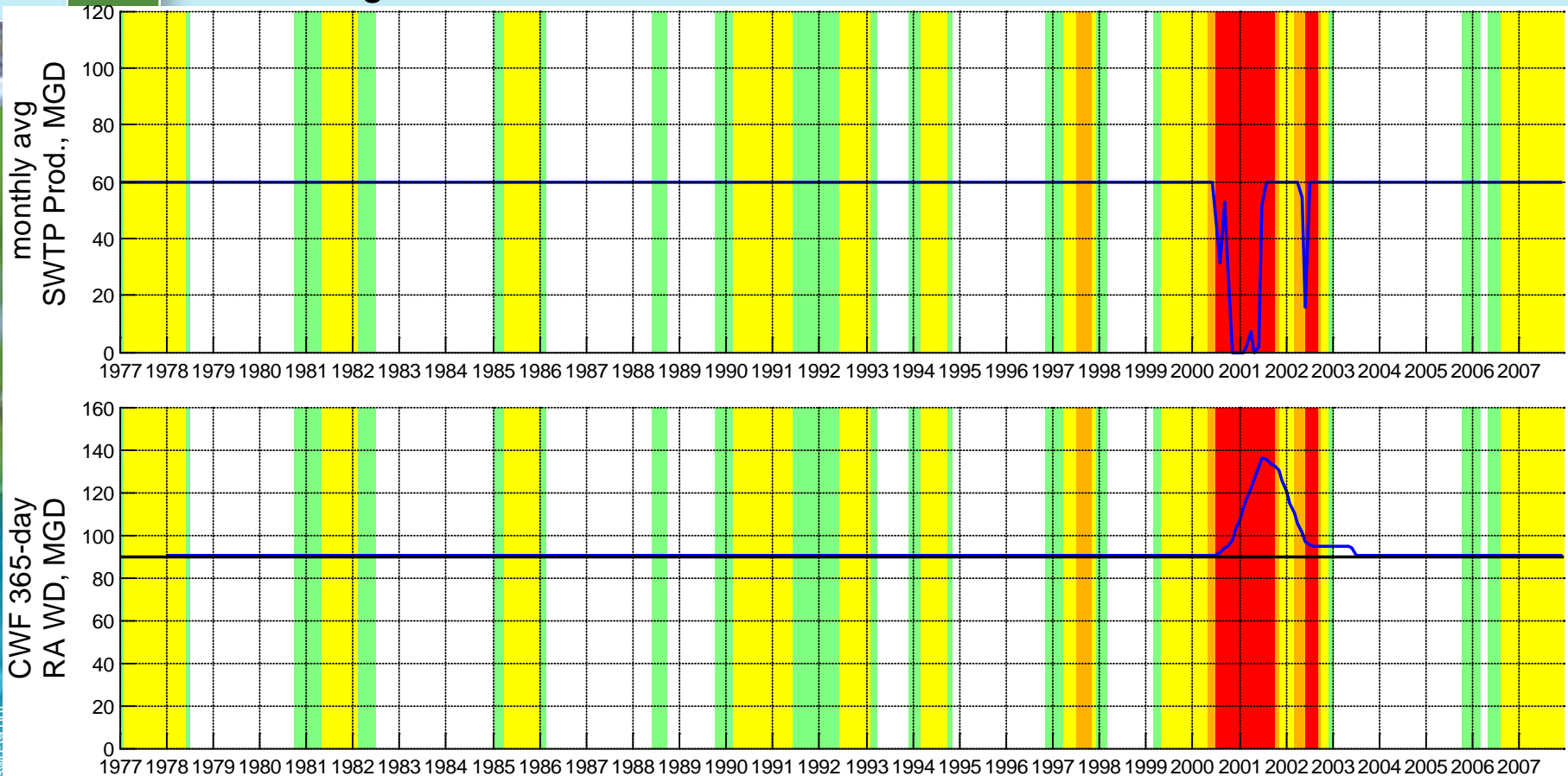
Demand Management Activities

- Examples of Actions
 - Restricting lawn watering
 - Limiting or eliminating non-essential uses
 - Public education and outreach
 - Percentage reductions and/or water budgeting
 - Temporarily modifying new construction requirements to delay new demands
 - Adjusting utility operations protocols
 - Accelerating existing conservation programs
- Restrictions intensify as severity increases



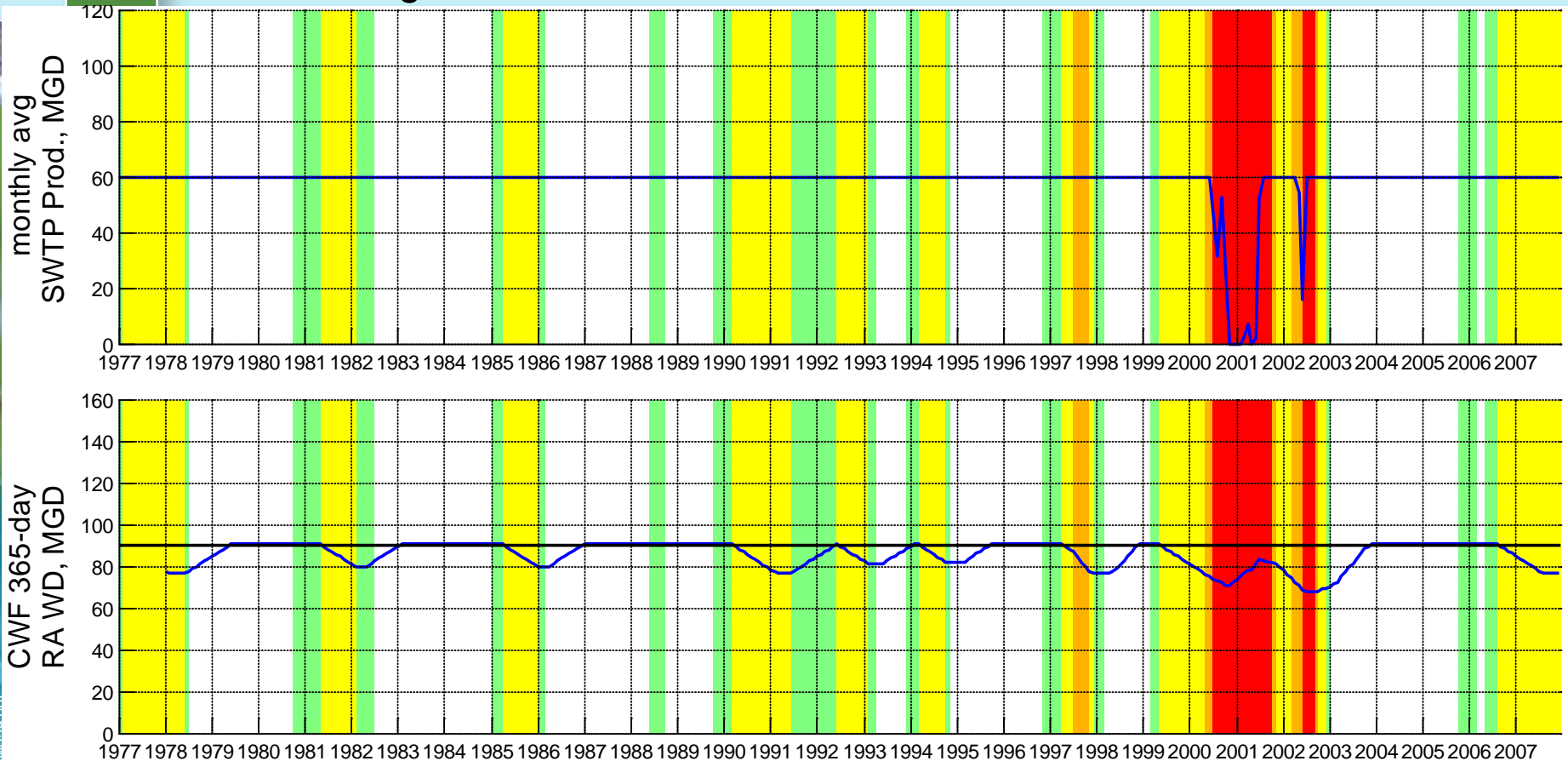
If Members Achieve Requested Demand Reductions During Shortages...

Monthly SWTP Production and CWF Rolling Average Withdrawal with Simulated Water Shortage Phase Declarations **WITHOUT Demand Reductions**

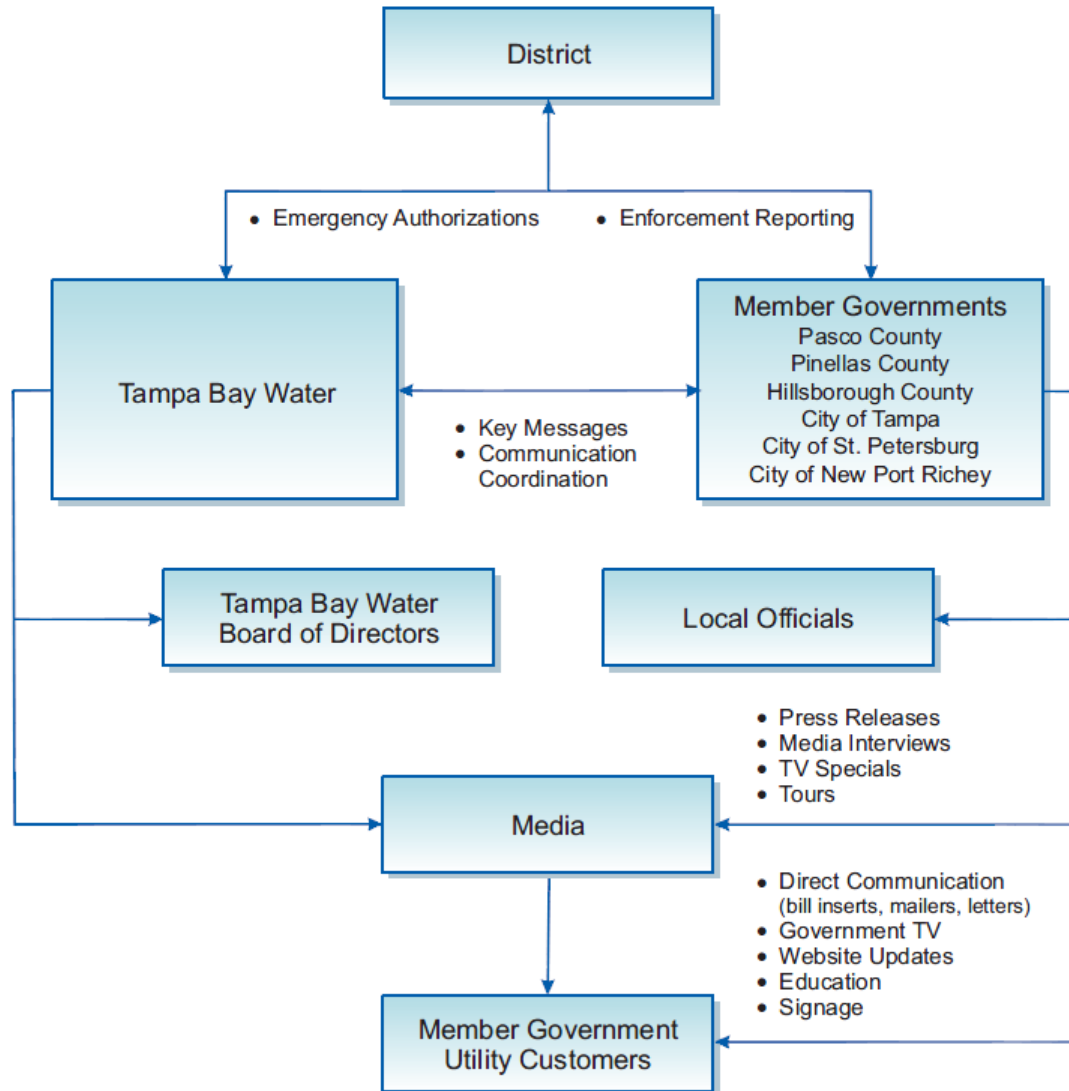


... Risks of GW Permit Limit Exceedences Would Be Eliminated.

Monthly SWTP Production and CWF Rolling Average Withdrawal with Simulated Water Shortage Phase Declarations **WITH Demand Reductions**

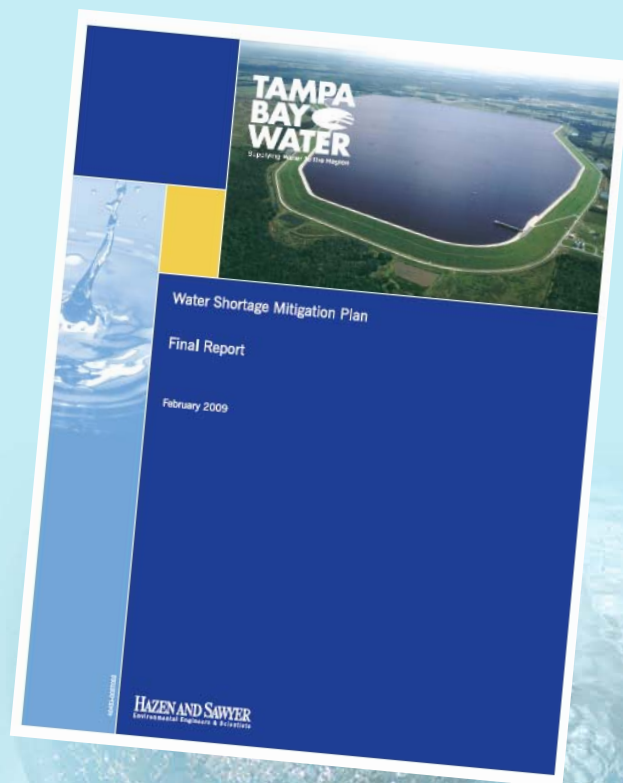


Communication Plan



Summary and Conclusions

- TBW Water Shortage Mitigation Plan
 - Monitors and detects shortage within local supply bodies
 - Defines proactive triggers that indicate high likelihood of impending shortage
 - Includes responses geared to maximally conserve permitted groundwater supply and increase surface water supply
 - Improves ability to manage and meet demand during drought-driven shortage periods.



The background of the slide is a deep blue gradient. On the left side, there is a vertical strip with a close-up image of a water tap faucet dripping a single drop of water. The top of the slide features a lighter blue gradient with a soft, out-of-focus image of water splashing, creating many small bubbles. The overall theme is clean water and environmental science.

Thank you!

Questions?

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