

State of Florida/SFWMD ROG Science Workshop

West Palm Beach, FL

November 17-18, 2009

The Miccosukee Tribe of Indians of Florida
Tribal Perspective on
Constraints
to Restoring Flows Through the Everglades

Terry L. Rice

Colonel (Ret'd), PhD, PE

CONSTRAINT #1:

IRREVERSIBLE DAMAGE



It Is Imperative that the Irreversible Damage Must Be Stopped Now

“Every day that water does not flow from north to south as it did before man modified the Everglades system, is a day during which the Everglades will experience irreversible damage, and one day, not too far in the future, we will reach a point where restoration will simply not be possible.”

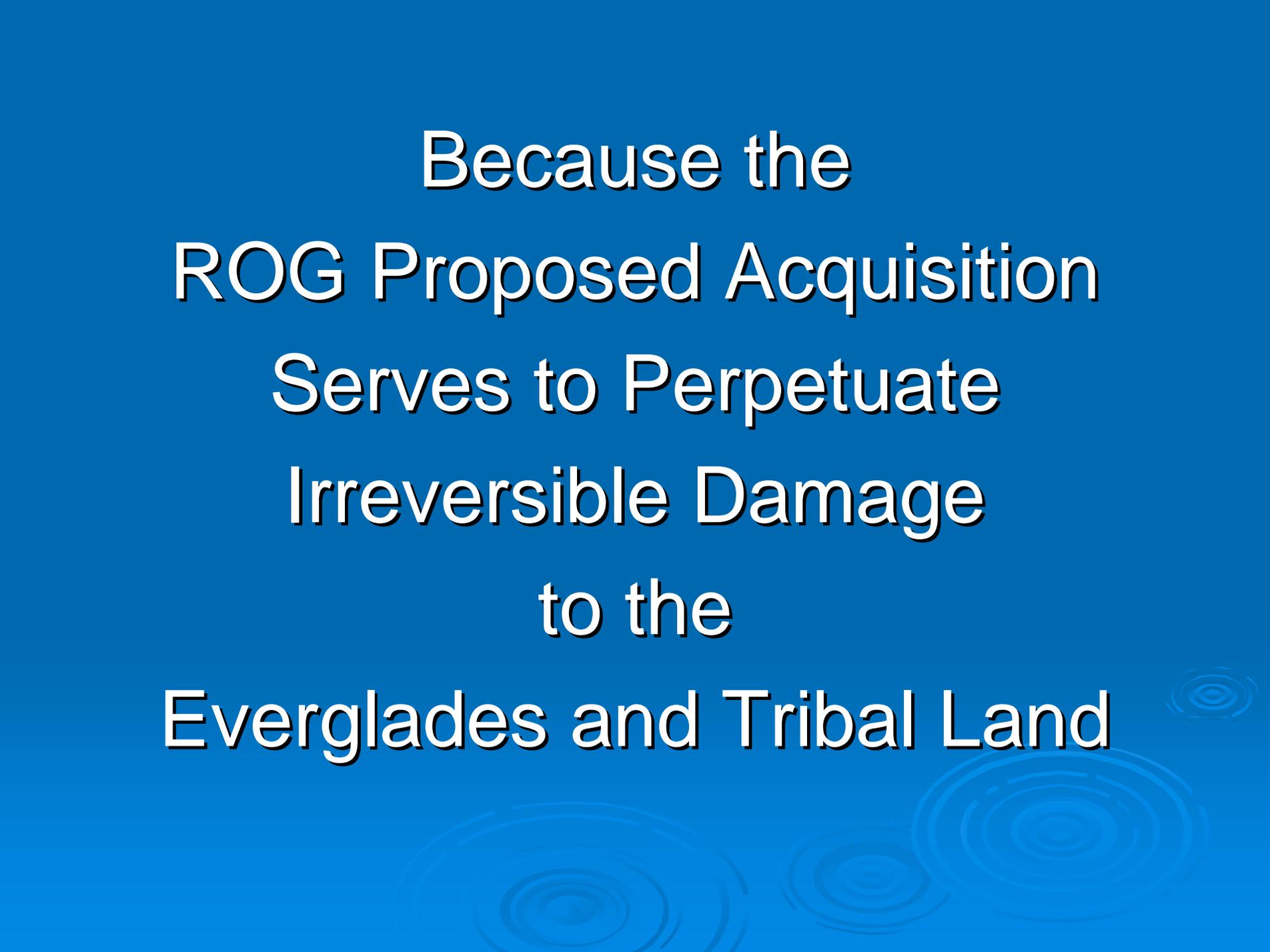
T.L. Rice, CISRERP Brief, Miami, FL,
September 2007

CISRERP 2008 Everglades Report

“If ecological resilience is not restored, the possibility exists that environmental changes could precipitate rapid and deleterious state changes that might be very difficult or impossible to reverse. Unless near-term progress is achieved on major restoration initiatives, including CERP and non-CERP efforts, opportunities for restoration may close with further loss of species numbers and habitat deterioration, and the Everglades ecosystem may experience irreversible losses to its character and function.” Progress Toward Restoring the Everglades, The Second Biennial Review, p. 69, CISRERP, 2008

The Miccosukee Tribe could not agree more ... and this conclusion is the basis of why the Tribe does not support the ROG Acquisition and Associated Planning ...

Because the
ROG Proposed Acquisition
Serves to Perpetuate
Irreversible Damage
to the
Everglades and Tribal Land



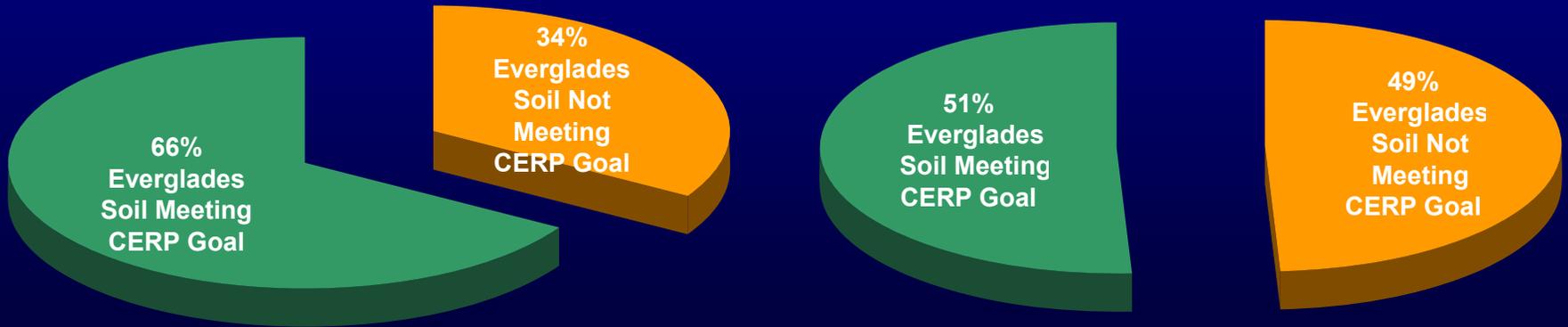
Irreversible Damage – Soil P

EPA REMA-P 1995-96 Study
Percent of Everglades Soil Above
CERP Goal of 400 mg/kg



~ 10 Years

EPA REMA-P 2005 Study
Percent of Everglades Soil Above
CERP Goal of 400 mg/kg

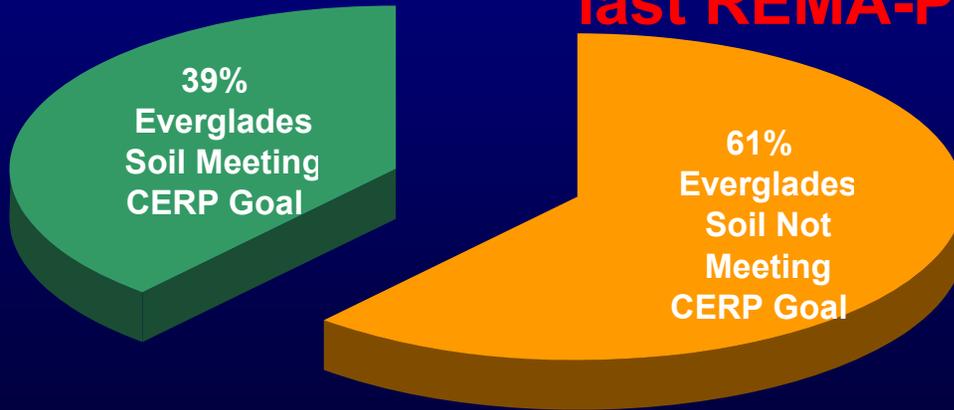


In approximately 10 years the percentage of Everglades impacted by soil P above the Comprehensive Everglades Restoration Plan goal of 400 mg/ml increased from ~34% to ~49% ... approximately a 46% increase in Everglades irreversibly damaged ... and this during a period of time when most believed that Everglades restoration was being accomplished

Irreversible Damage – Soil P

Projected EPA REMA-P 2015 Study Results
Percent of Everglades Soil Above
CERP Goal of 400 mg/kg

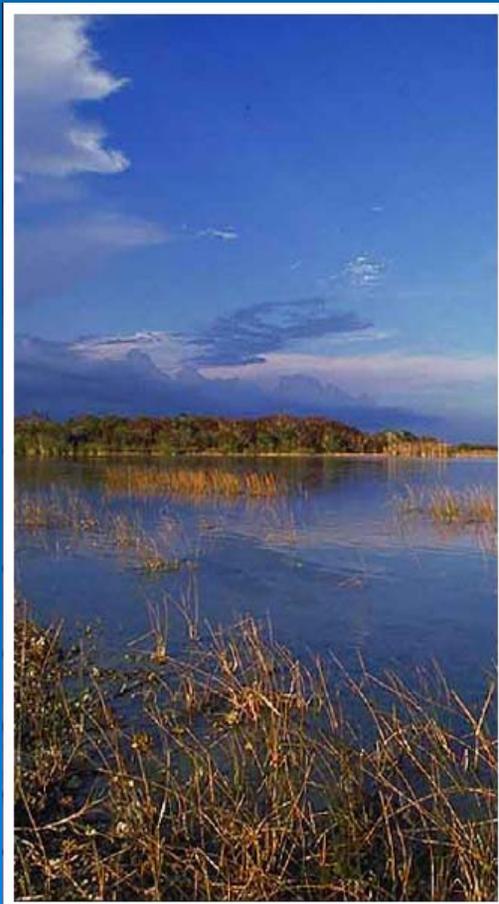
**~ 10 Years after
last REMA-P**



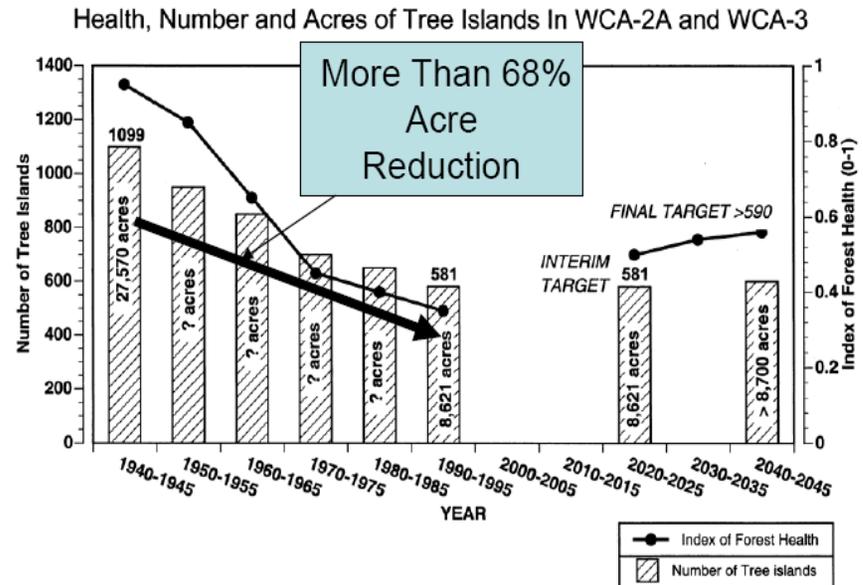
Given the current rate of P accumulation in the soil of the Everglades, in 10 years after the last REMA-P Study (~5 years from now), well over 50% of the Everglades will be impacted above CERP goals

**THE MICCOSUKEE TRIBE CANNOT SUPPORT ANYTHING THAT
EXACERBATES THIS IRREVERSIBLE DESTRUCTION ...
AND THE ROG ACQUISITION DOES JUST THAT**

Irreversible Damage – Tree Islands



Tree Island Destruction 1940 to 1995

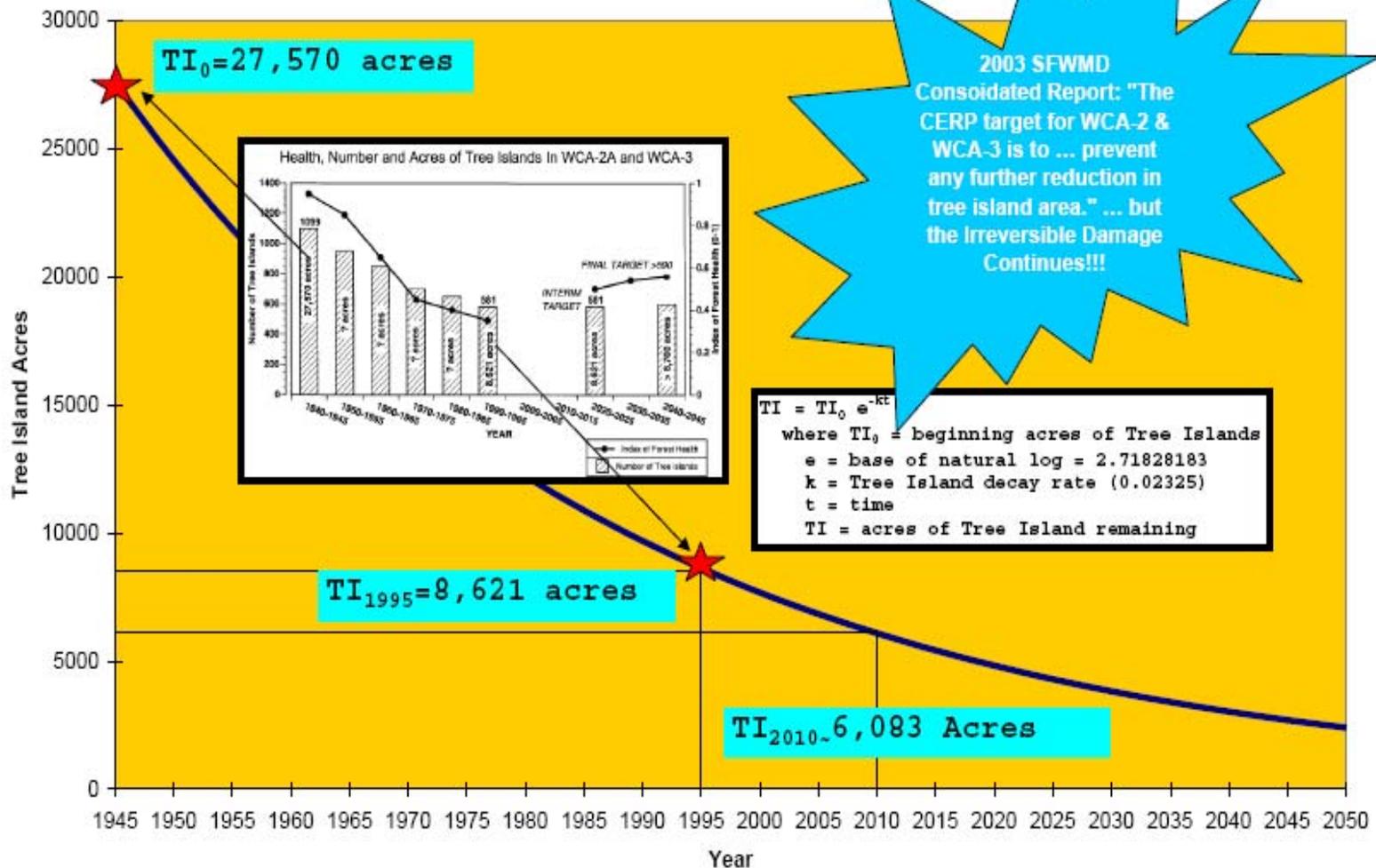


US Army Corps of Engineers–8.5 SMA GRR/EIS July 2000–
cost of delay in implementing Mod Waters project:

- “loss of tree islands has an impact on the critical habitats and cultural resources”
- “it is estimated as loss of 8.4 islands and 246 acres per year”
- “estimated values for full restoration of tree islands may range from \$50,000 to \$500,000 per acre”

Irreversible Damage – Tree Islands

Tree Island Destruction in WCA-2A & WCA-3
An Approximation of Continuing Irreversible Damage



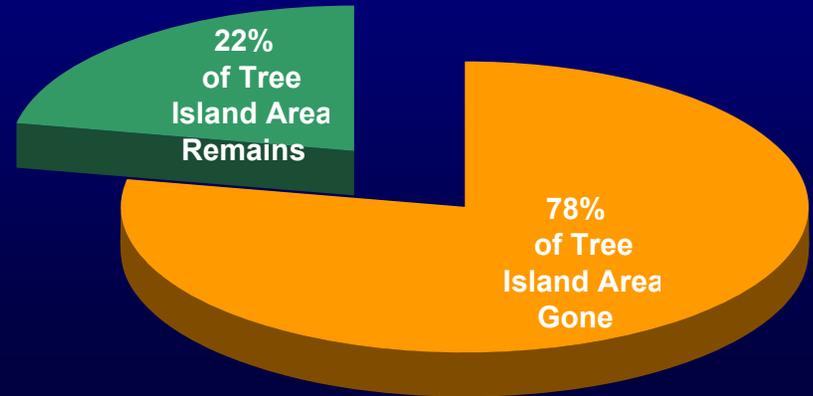
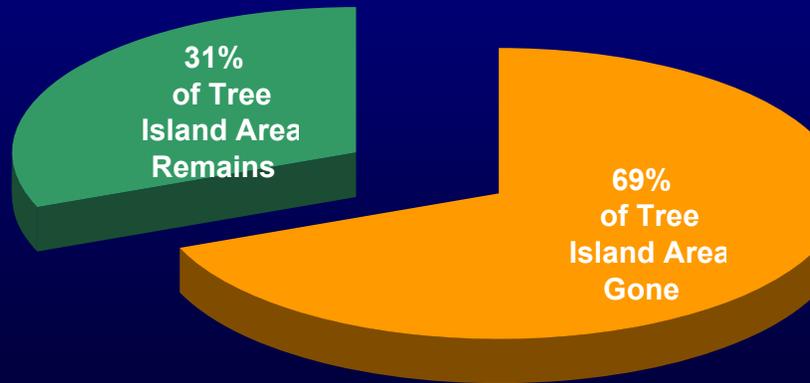
Irreversible Damage – Tree Islands

Tree Island Destruction
in WCA-2A & WCA 3
by 1995



~ 15 Years

Projected Tree Island Destruction
in WCA-2A & WCA 3
by 2010

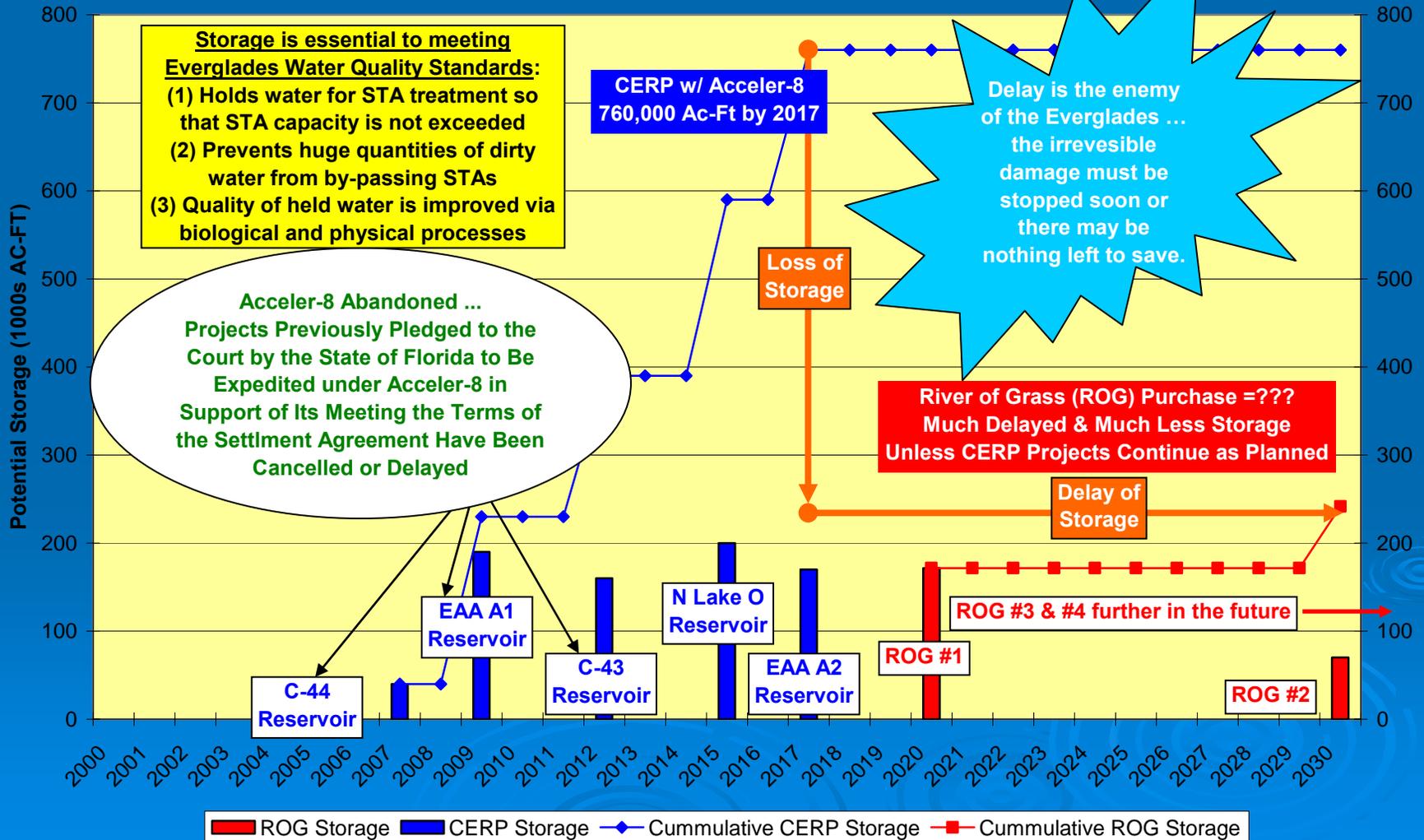


In approximately 15 years the percentage of Tree Islands destroyed in WCA-2A & WCA-3 of the Everglades has increased an approximation is from ~69% to ~78% ... approximately a 29% increase in Everglades irreversibly damaged ... and this during a period of time when most believed that Everglades restoration was being accomplished

THE MICCOSUKEE TRIBE CANNOT SUPPORT ANYTHING THAT EXACERBATES THIS IRREVERSIBLE DESTRUCTION ... AND THE ROG ACQUISITION DOES JUST THAT

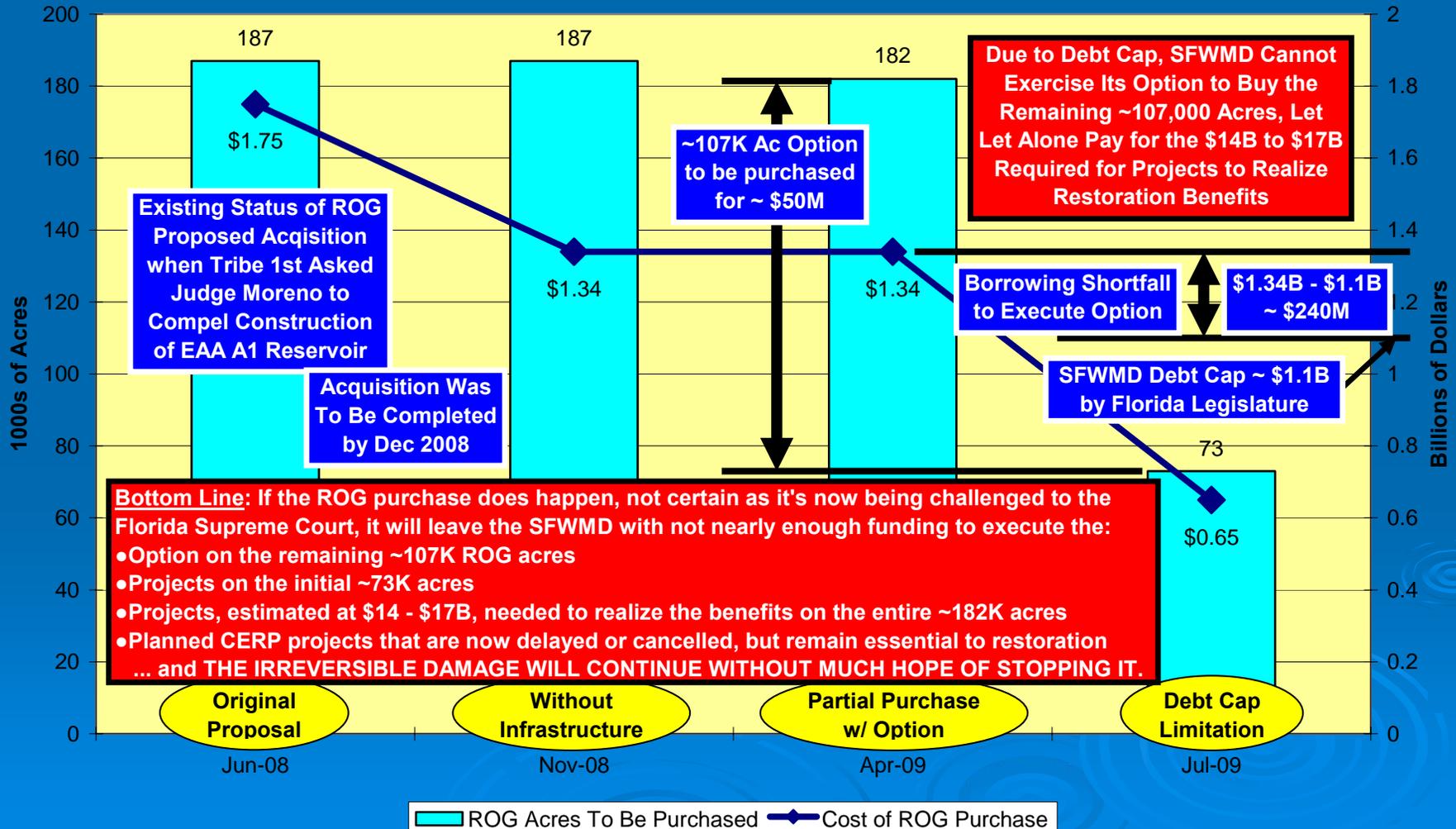
Irreversible Damage Exacerbated

ROG Cancels or Delays CERP Planned Everglades Restoration Storage
Thus, Unacceptable, Irreversible Damage Is Allowed to Continue



Irreversible Damage Exacerbated

Proposed "RIVER OF GRASS" Acquisition
 THE CONTINUOUS DEGENERATION FROM WHAT BEGAN AS A BAD IDEA ...
 A PERFECT EXAMPLE OF "GOING FROM BAD TO WORSE" WITH NO BOTTOM IN SIGHT



Irreversible Damage

Constraint: The Tribe Will Not Support Anything That Exacerbates Irreversible Damage to the Everglades ... i.e., the Bleeding Must Be Stopped at the Soonest, or the Patient Will Die

CONSTRAINT #2:

**INCONGRUOUS LOSS OF
EVERGLADES**



Everglades Restoration – Flow

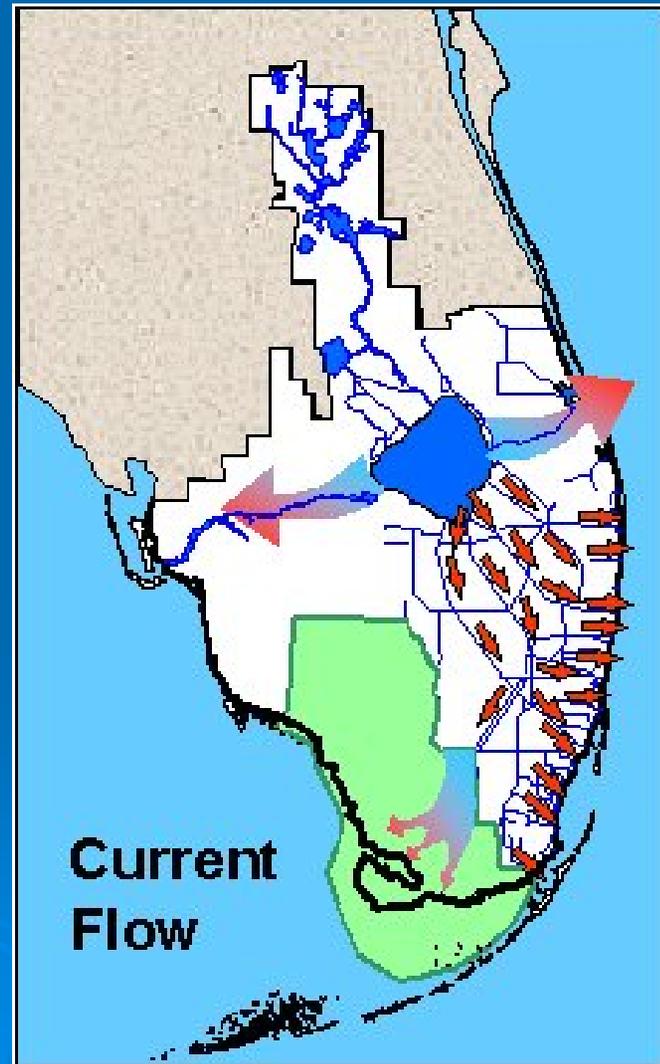
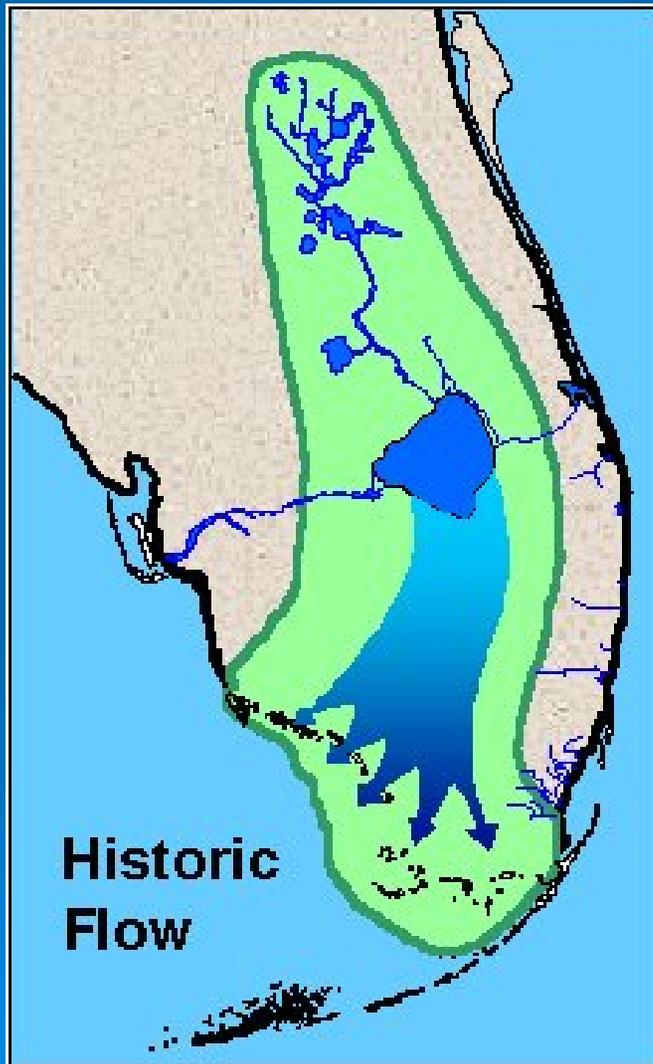
CERP Yellow Book – The Effects of Decompartmentalization and the C&SF Restudy, Sue Perry, ENP; Cheryl Buckingham, FWS; Bill Loftus; BRD, USGS

“[1] The natural system has been reduced to approximately half of its historic spatial extent. [2] It can no longer handle the tremendous volumes of water necessary to maintain hydroperiods in Shark River Slough and proper salinities in Florida Bay without increasing the severity of damaging extreme depths and hydroperiods in the Water Conservation Areas. [3] Canals are capable of conveying water to the south quickly and efficiently, substituting for the missing part of the Everglades.”

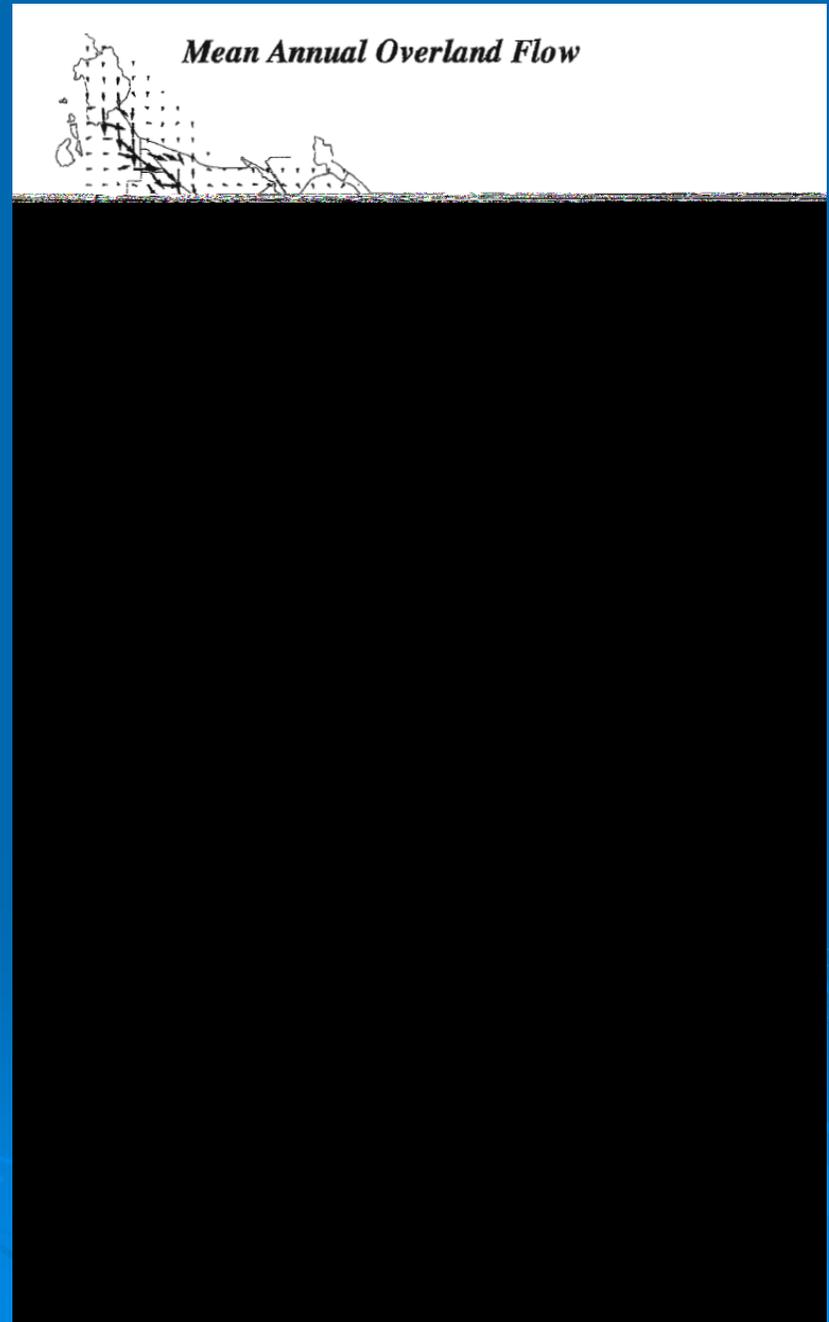
Anthropogenic Modifications

“[1] The natural system has been reduced to approximately half of its historic spatial extent.”

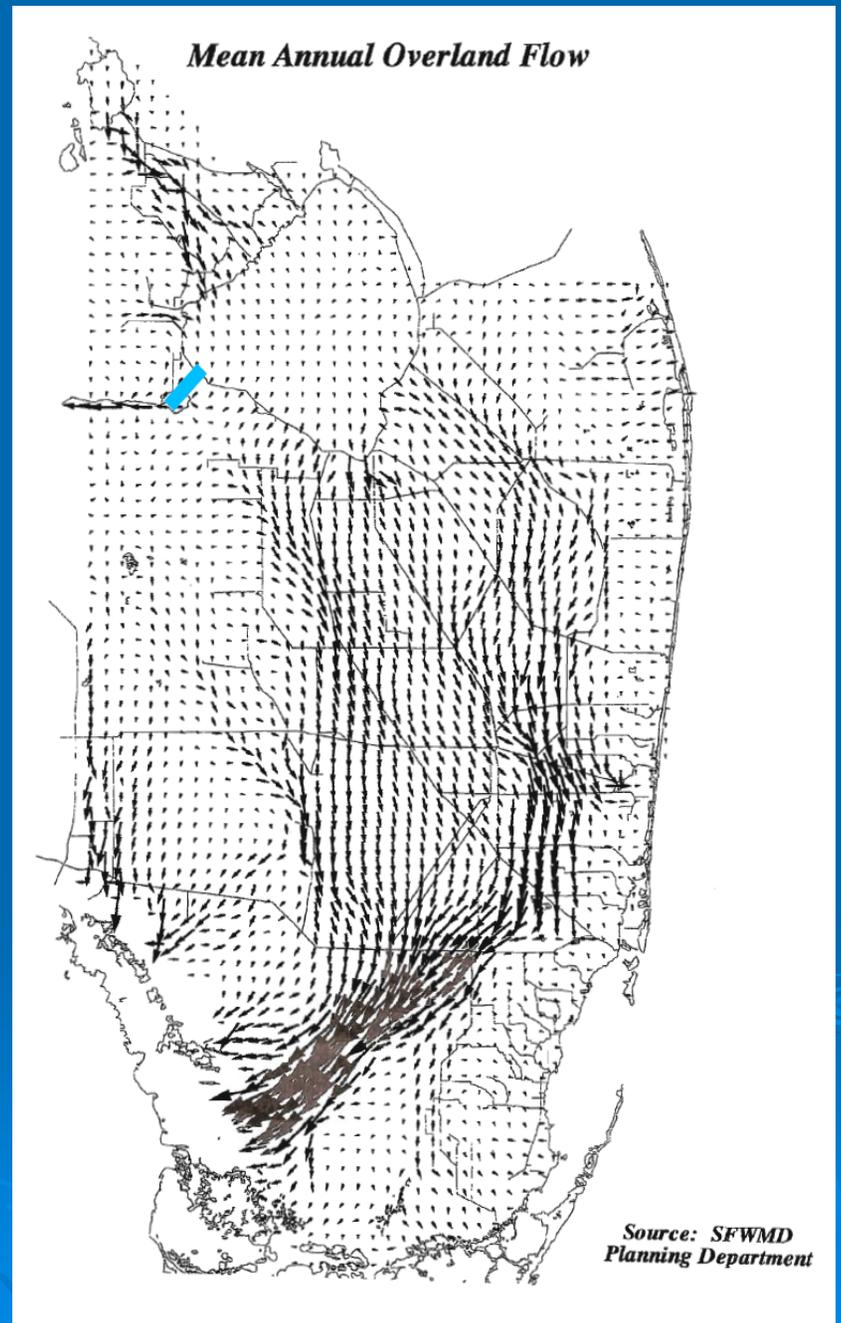
Before & After



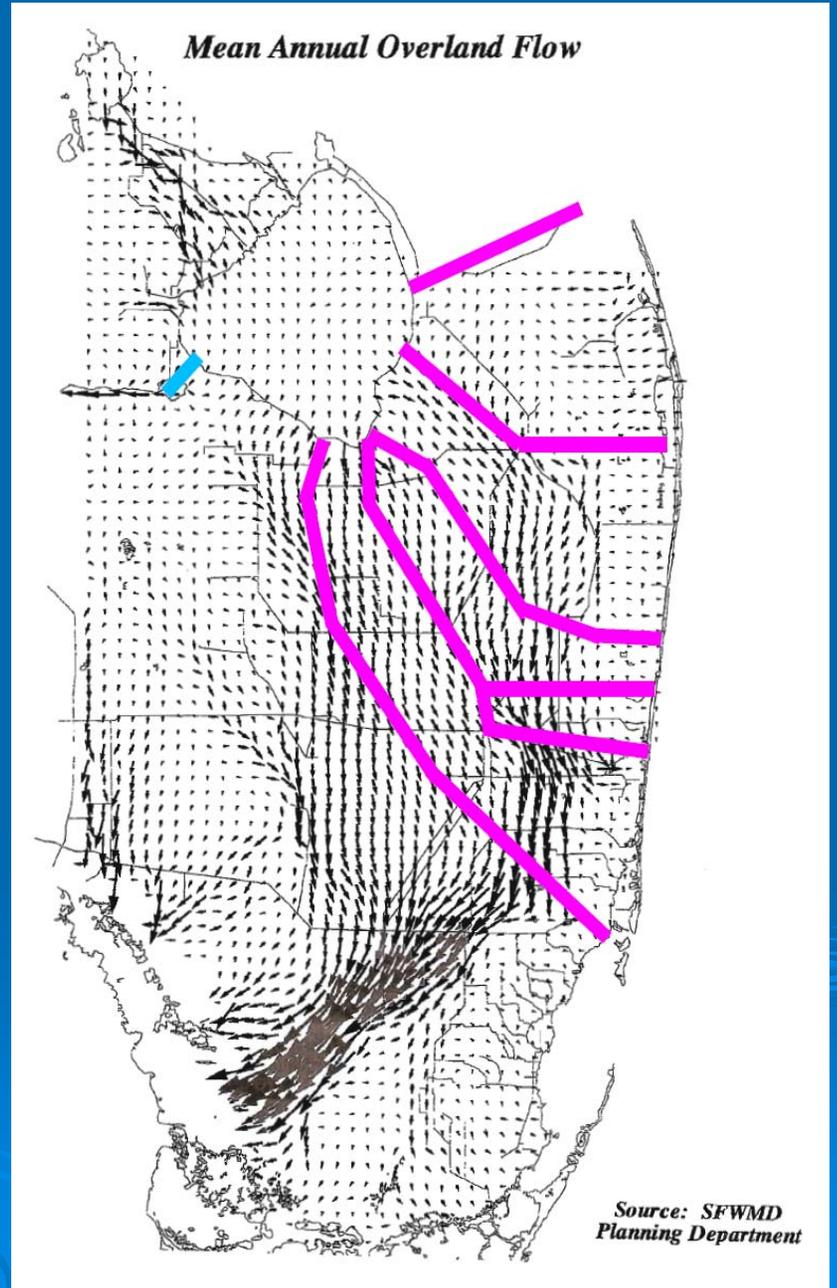
Natural System Model (NSM)



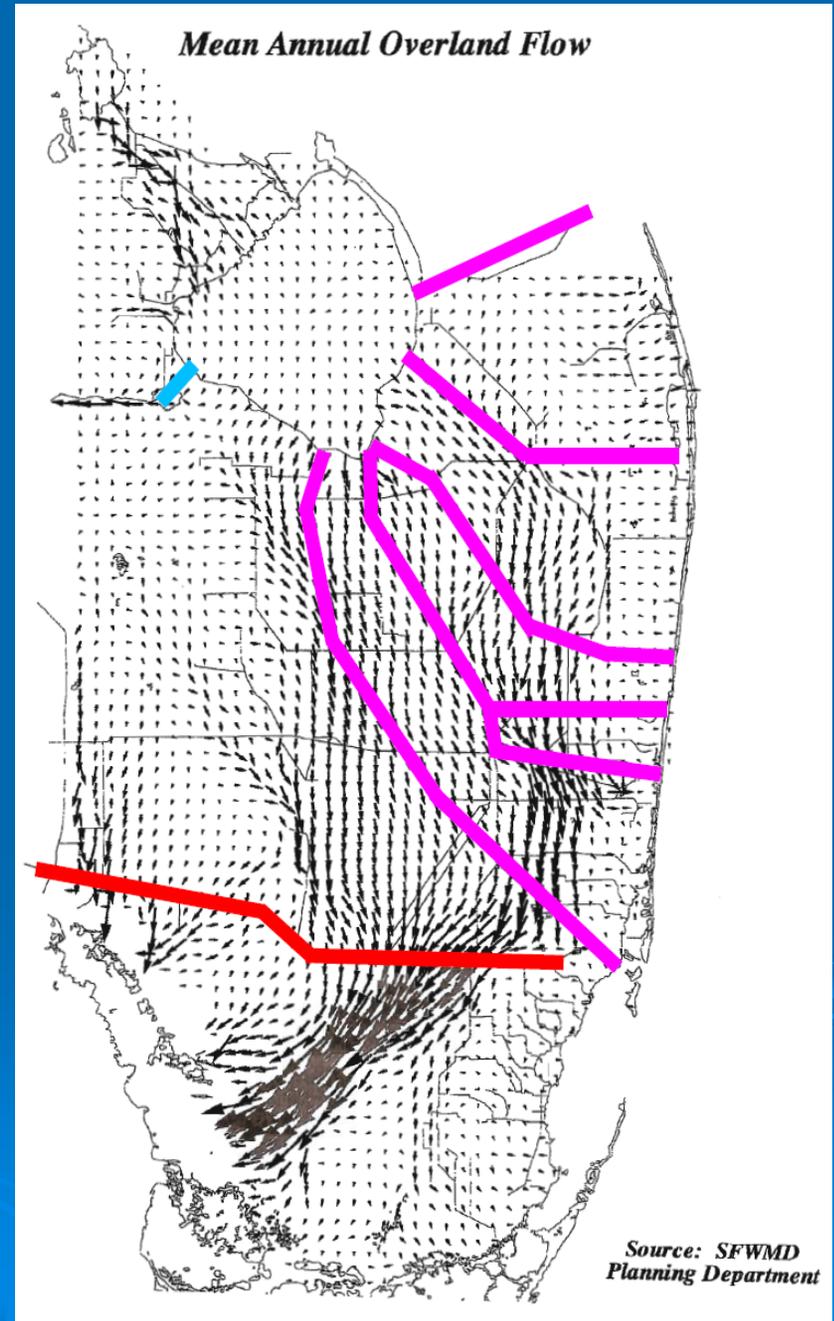
Hamilton Disston 1881 – 1994



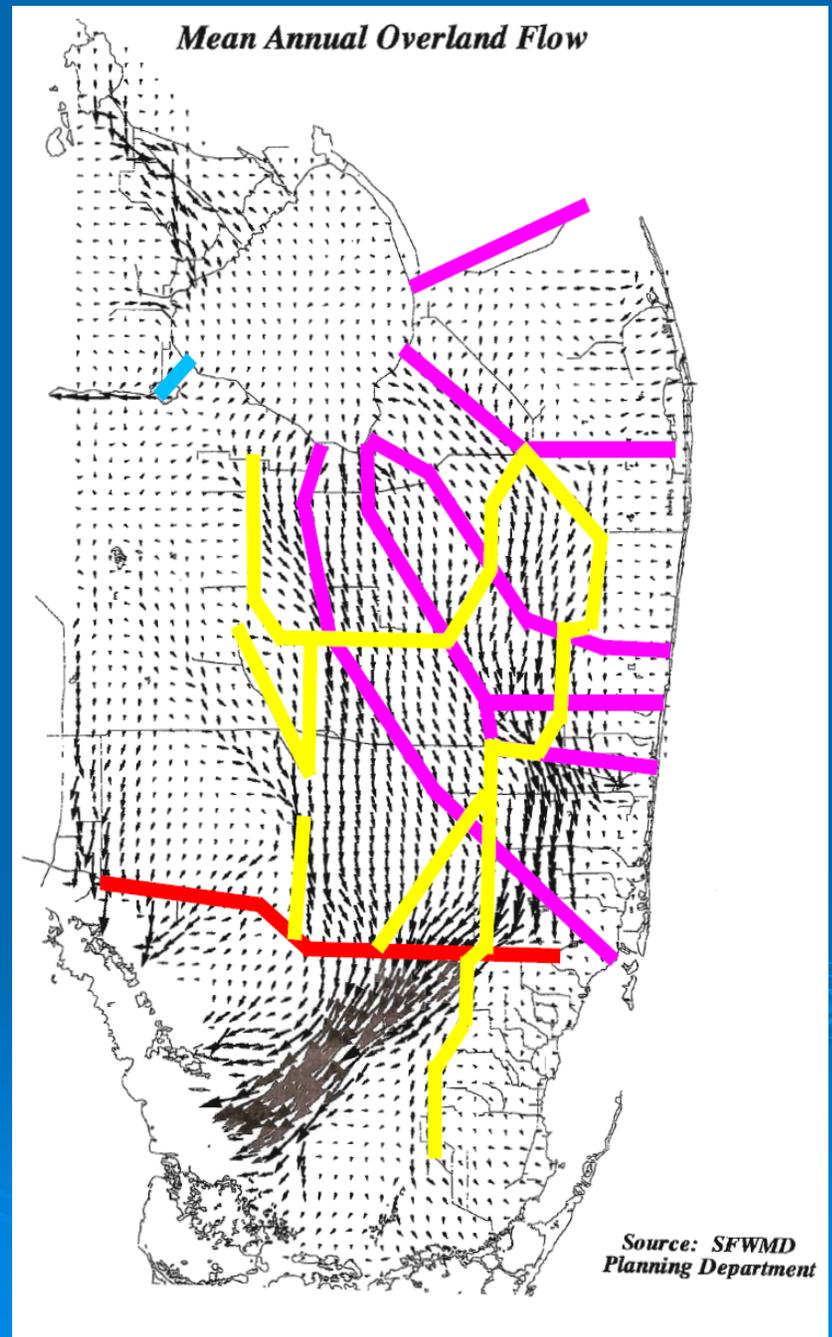
Napoleon
Bonaparte
Broward
1907 – 1917
(1931)



Tamiami Trail 1915 – 1928



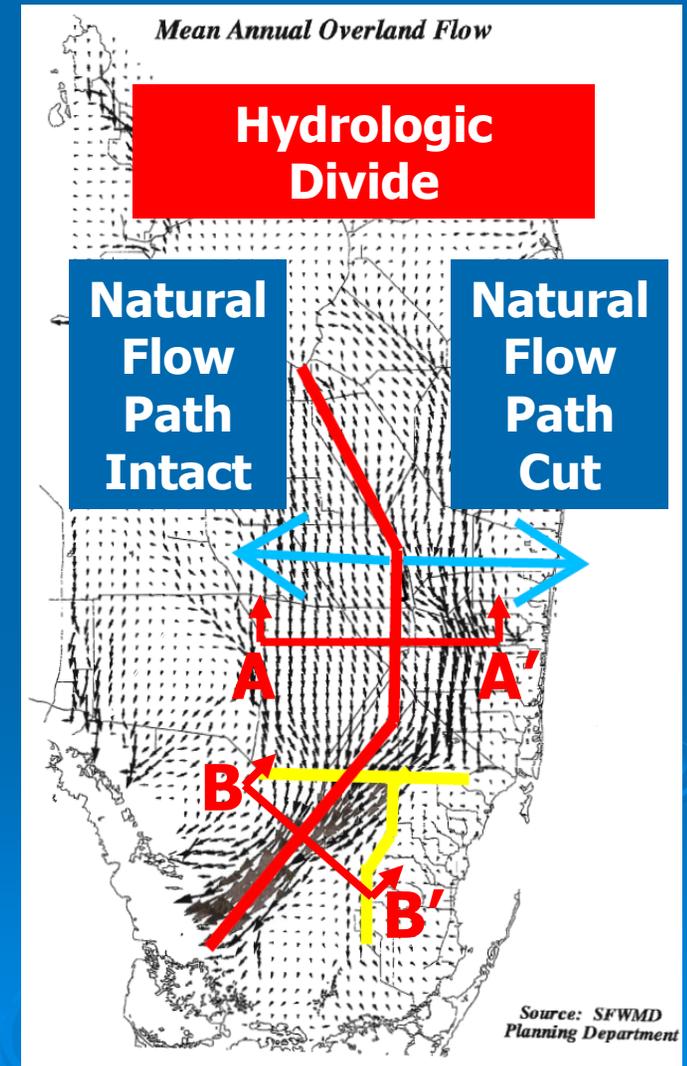
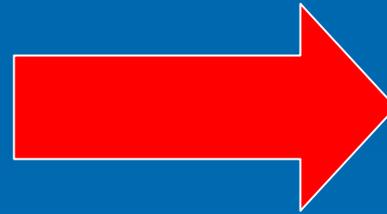
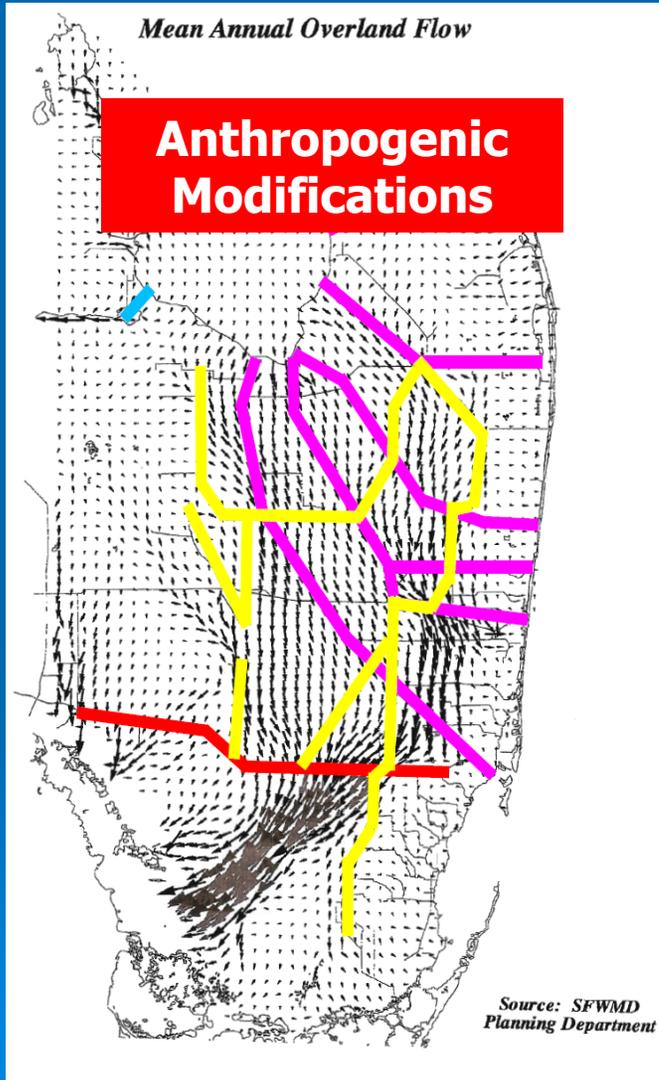
The Central & Southern Florida Project (C&SF) 1947 – Present



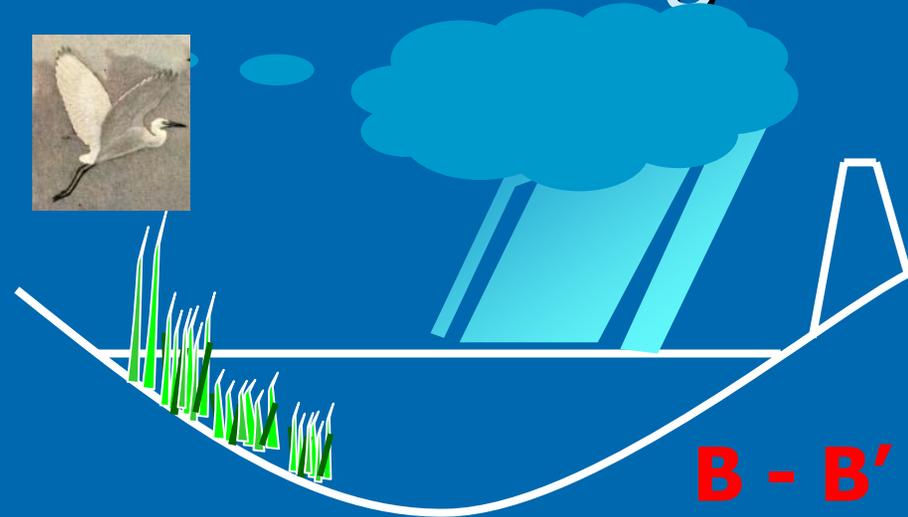
Hydrologic Result of Anthropogenic Modifications

“[2]It can no longer handle the tremendous volumes of water necessary to maintain hydroperiods in Shark River Slough and proper salinities in Florida Bay without increasing the severity of damaging extreme depths and hydroperiods in the Water Conservation Areas.”

The Hydrologic Divide

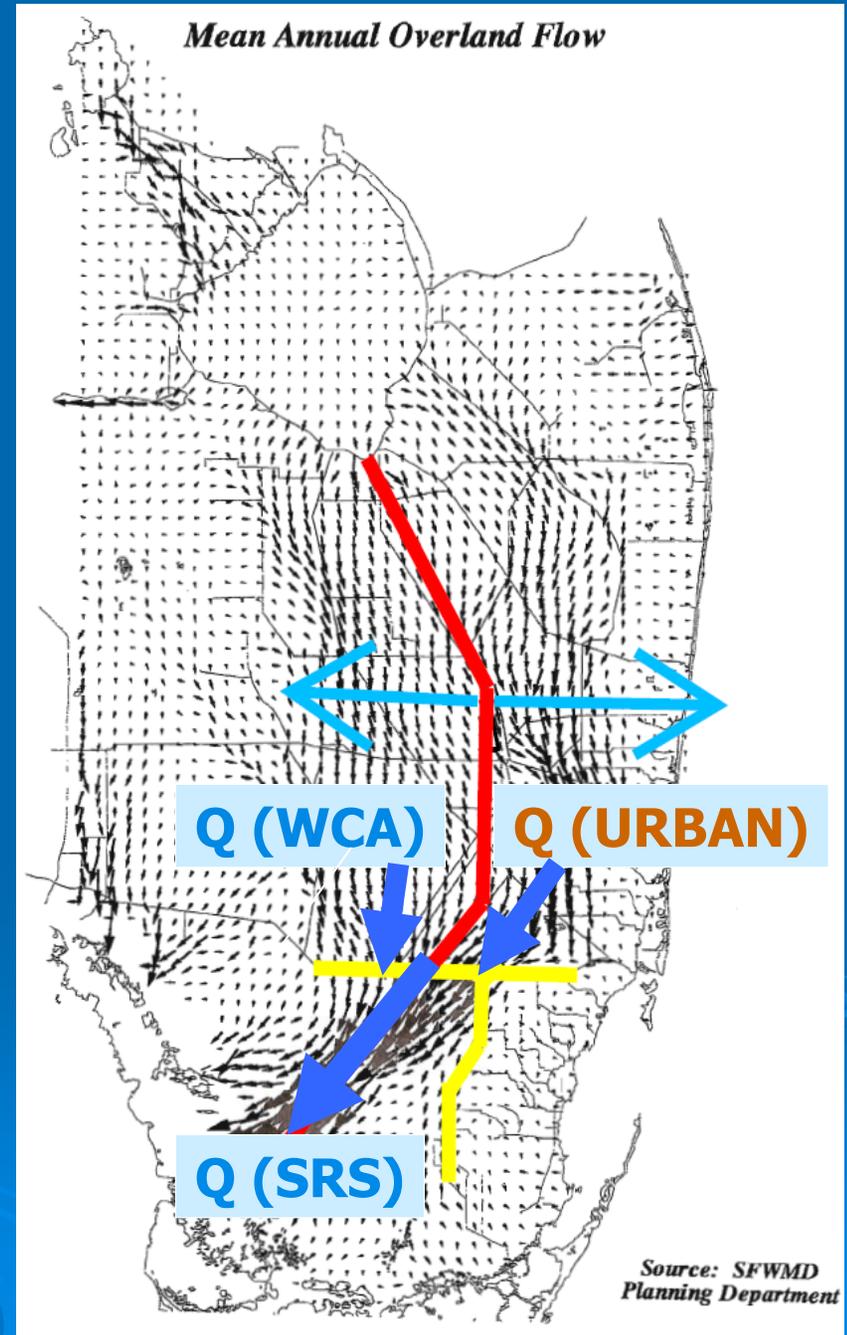


Impact of Hydrologic Divide WCAs versus Shark River Slough

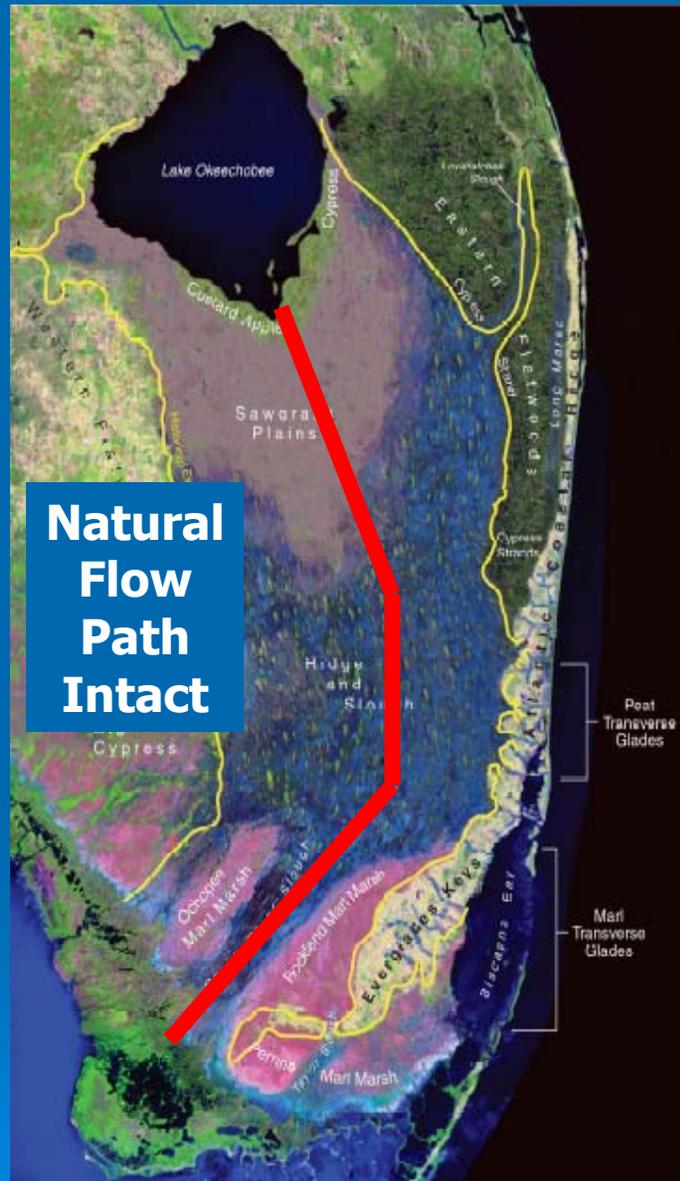


Therefore, restoration flows for Shark River Slough include two components, i.e.

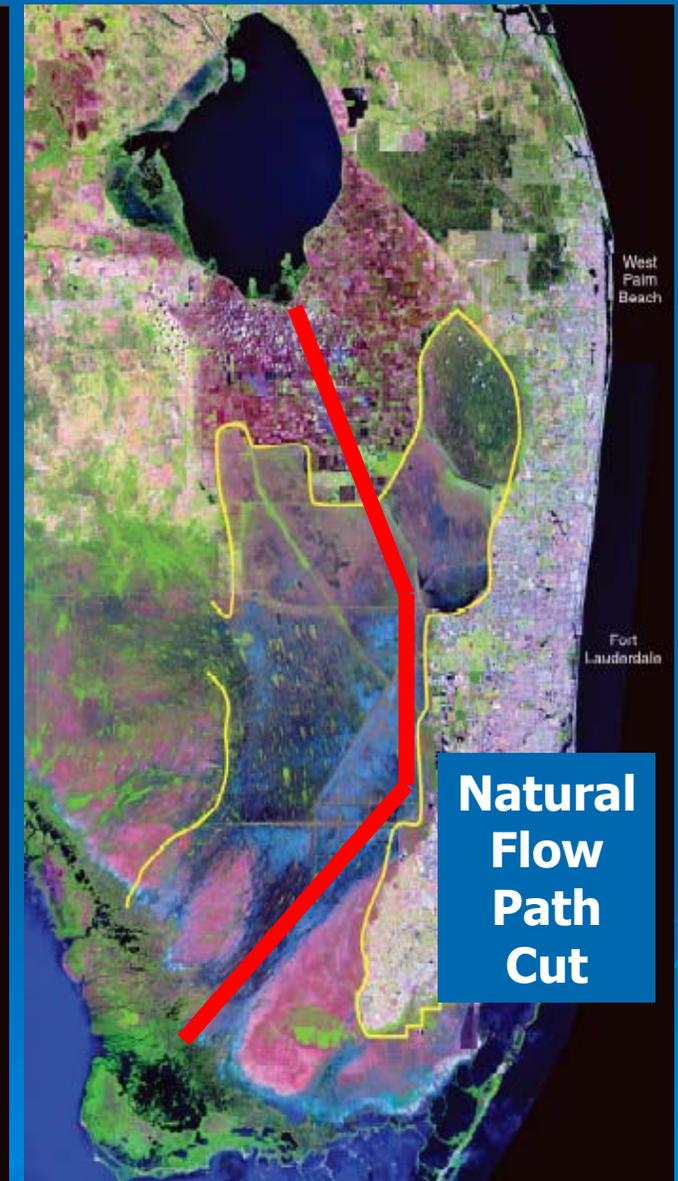
$$Q(\text{SRS}) = Q(\text{WCA}) + Q(\text{URBAN})$$



Pre- & Post- Change Aerial Views ... Same Result



~ 1850



~ 1995

Summary of Hydrologic Changes Due To Anthropogenic Modifications

Result is $Q(\text{SRS}) = Q(\text{WCA}) + \cancel{Q(\text{URBAN})}$

And $Q(\text{WCA}) = \text{Velocity} \times \text{Area}$

or, $Q(\text{WCA}) \sim \text{Velocity}(\text{WCA}) \times \text{Depth}(\text{WCA}) \times \text{Width}(\text{WCA})$

Post changes, if $Q(\text{WCA})$ is forced = $Q(\text{SRS})$

Then $\text{Velocity}(\text{WCA})$ and/or $\text{Depth}(\text{WCA})$ must increase ... both are destructive to WCAs

THUS, TO RESTORE WCAs & SRS,

Q(URBAN) MUST BE RESTORED

Dealing Effectively with the Hydrologic Consequences of Anthropogenic Modifications

“[3]Canals are capable of conveying water to the south quickly and efficiently, substituting for the missing part of the Everglades.”

... and CERP included plans/projects to provide for Q(URBAN) ... examples follow ...

CERP Plan for Providing Q(URBAN)

CERP Yellow Book 9.1.8.16 Diverting Water Conservation Area 2 and 3 flows to Central Lake Belt Storage Area (YY and ZZ) ... *“The purpose of this feature is to attenuate high stages in Water Conservation Areas 2 and 3 and transport this excess water to the Central lake Belt Storage Area where it will be stored to meet downstream demands in Shark River Slough ...”*

CERP Plan for Providing Q(URBAN)

CERP Yellow Book 9.1.8.20 Bird Drive Recharge Area (U) ... *“The purpose of the feature is to recharge groundwater and reduce seepage from the Everglades National Park buffer areas by increasing water table elevations east of Krome Avenue. The facility will also provide C-4 flood peak attenuation and water supply deliveries to the South Dad Conveyance System and Northeast Shark River Slough.”*

CERP Plan for Providing Q(URBAN)

CERP Yellow Book 9.1.8.21 L-31N

Improvements for Seepage Management and S-356 Structures (V and FF) ... *The purpose of this feature is to improve water deliveries to Northeast Shark River Slough and restore wetland hydropatterns in Everglades National Park by reducing levee and groundwater seepage and increasing sheetflow.*

CERP Plan for Providing Q(URBAN)

CERP Yellow Book 9.1.8.22 West Miami-Dade County Reuse (HHH) ... *The purpose of the feature is to meet the demands for: (1) the Bird Drive Recharge Area; (2) the South Dade Conveyance System; and (3) the Northeast Shark River Slough.*

... (1) Finding a way to reduce the number of damaging high water events in Water Conservation Area 2A and 3B and the Pennsuco Wetlands to a level at or below the level predicted for D-13R.

Why do some eschew Q(URBAN) as agreed to in CERP?

- Q(URBAN) is primarily “active control” ...
“active control” is anathema to some
- Q(URBAN) prevents use of WCAs as
STAs ... more important now that State
failed to meet its December 1, 2006
deadline for meeting the 10 ppb P Water
Quality Criteria under the provisions of the
Clean Water Act and the Consent Decree
... & there is no certainty that it ever will

What is the Tribe's position on restoration flows? Summary ...

- CERP got it right ... restore as much natural flow thru the Everglades as possible, but recognize and plan for additional flows for Shark River Slough ... must have both Q(WCA) and Q(URBAN) components
- Quality ... achieving Flows and Levels with Dirty Water produces IRREVERSIBLE DAMAGE
- Levels ... achieving Flows with destructive Levels produces IRREVERSIBLE DAMAGE
- Flows ... achieving Levels with less than optimum Flows is UNDESIRABLE
- Therefore, Flow should never be considered independently of Quality and Levels ... a balance among all 3 must be forged, implemented, and maintained

Incongruous Loss of Everglades

Constraint: The Tribe Will Not Support Any Plan That Drowns the WCAs in Order to Deliver Flows to the Park

CONSTRAINT #3:

SEEPAGE



SEEPAGE!!!

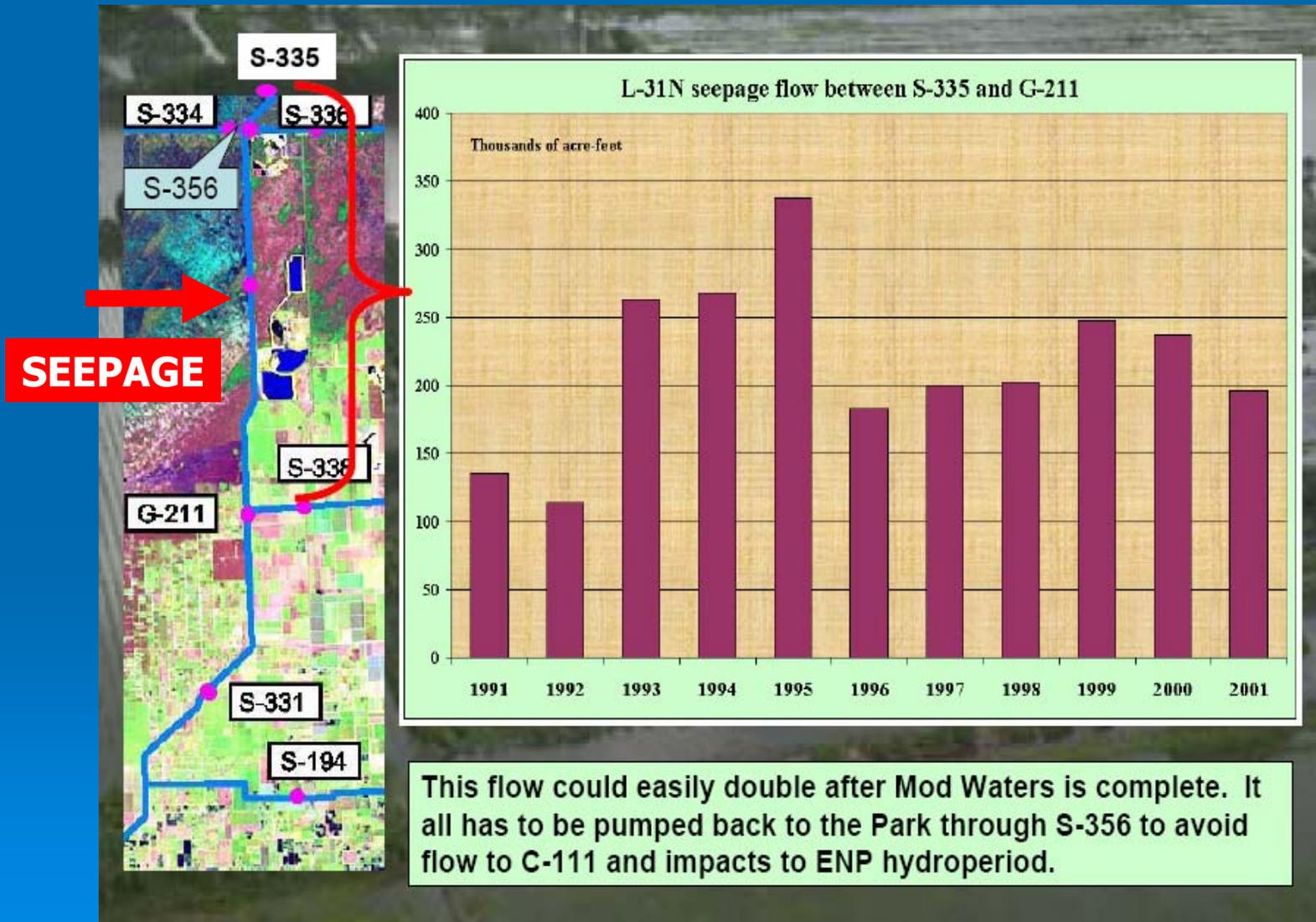
CERP, Section 6,

6.4.5.3 Everglades National Park

“Groundwater seepage loss is the main impediment to any kind of restoration within Everglades National Park. Its impact is far reaching, affecting every water management decision along Tamiami Trail.”

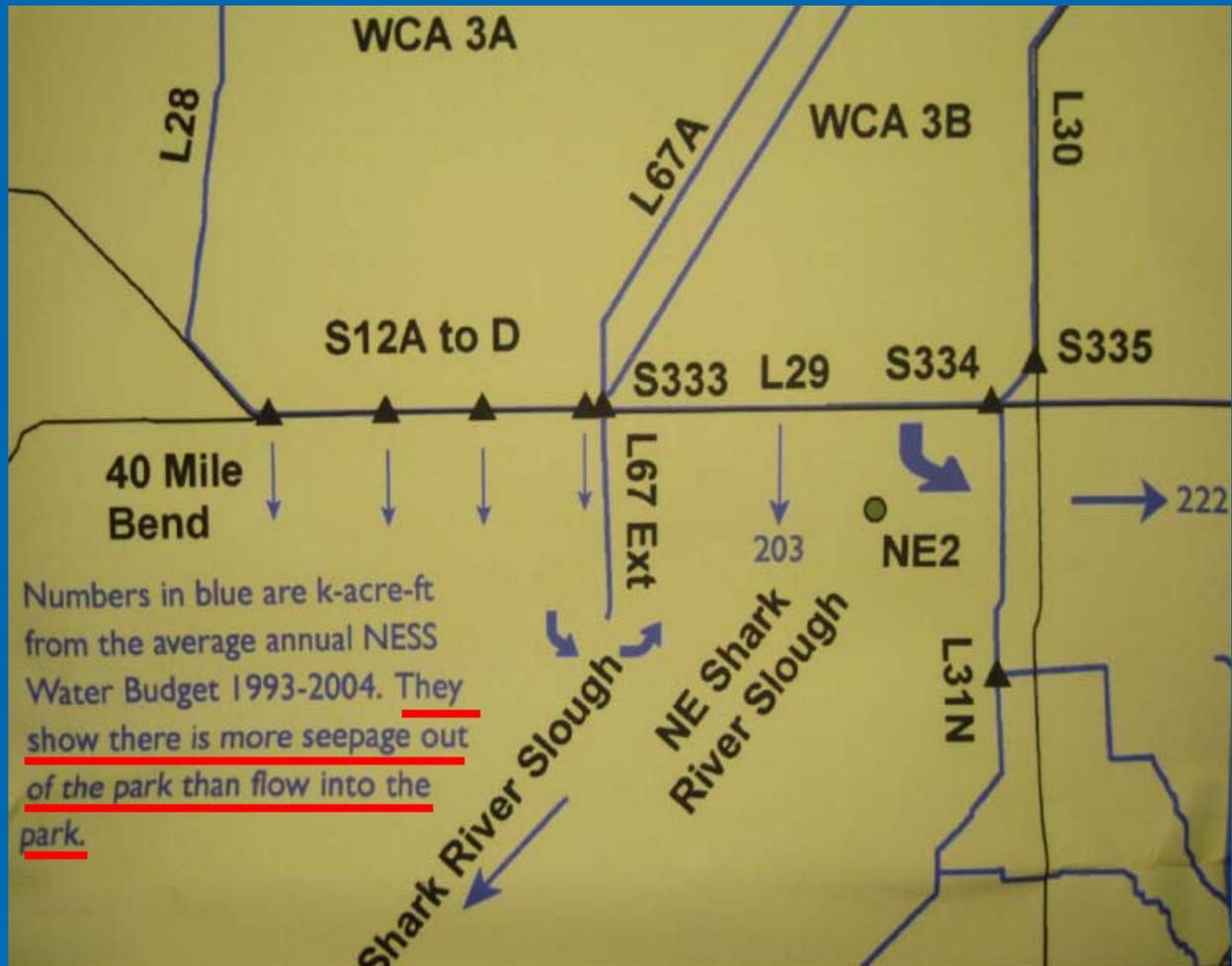
The Seepage Challenge

(MacVicar-3/8/04 CSOP Meeting)



NPS Poster for GEER Science Conf 2008

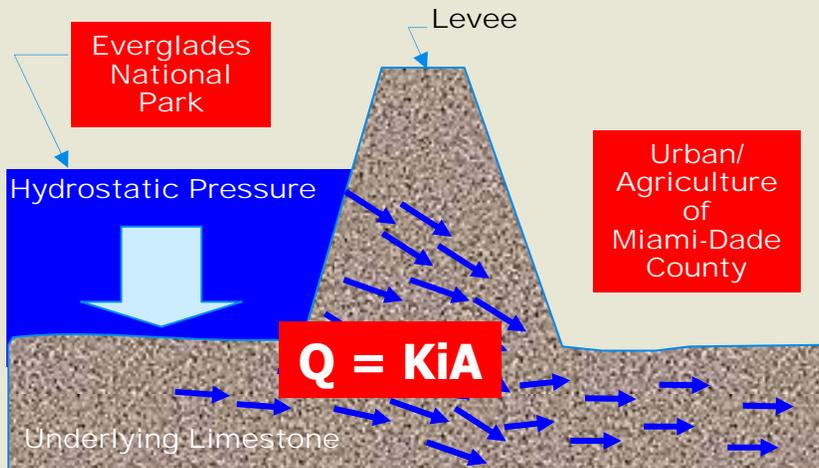
Confirms
Seepage is
a Major
Issue



For additional information:
Roy Sonenshein (roy_sonenshein@nps.gov)
Vin DiFrenna (vincent_difrenna@nps.gov)

Another Elephant in the Room ... SEEPAGE!!!

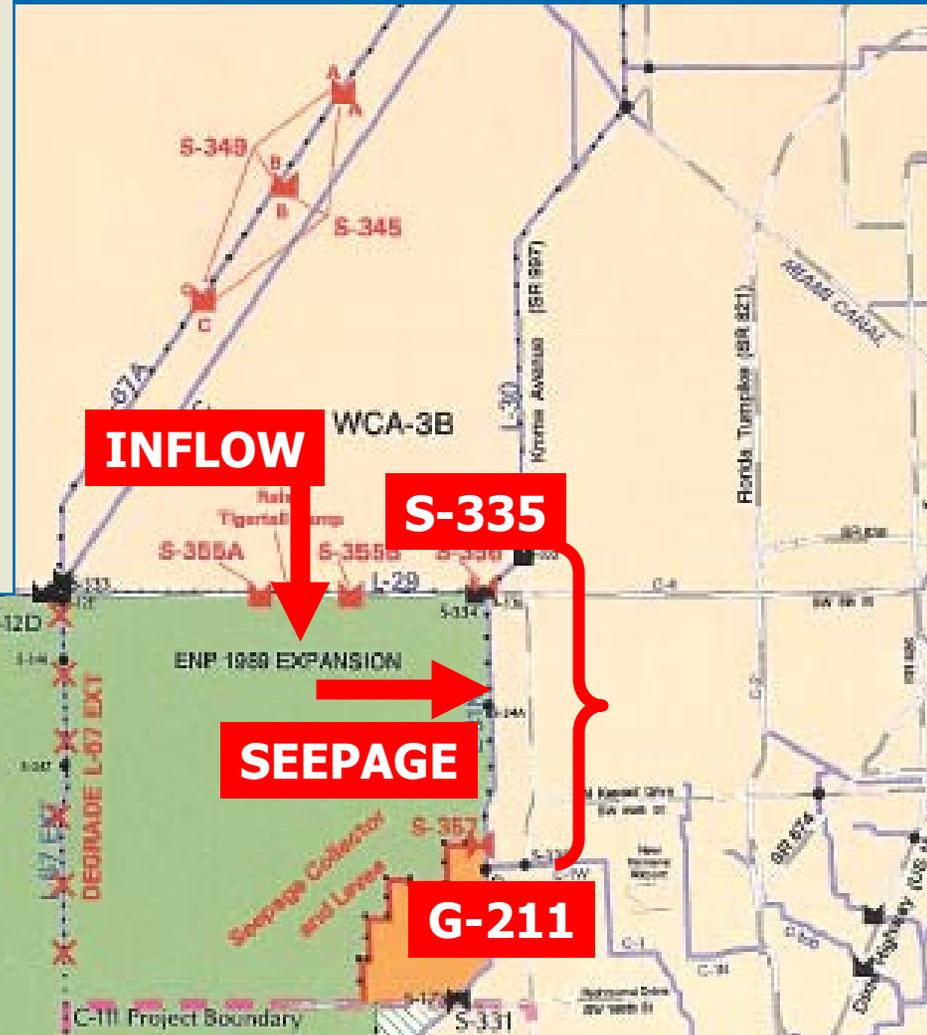
L-31N Levee Schematic



With Restoration ...

- K Remains High
- i Increases
- A Remains the Same

(Unless a Seepage Barrier is Utilized)



Biscayne Aquifer Actual Layers

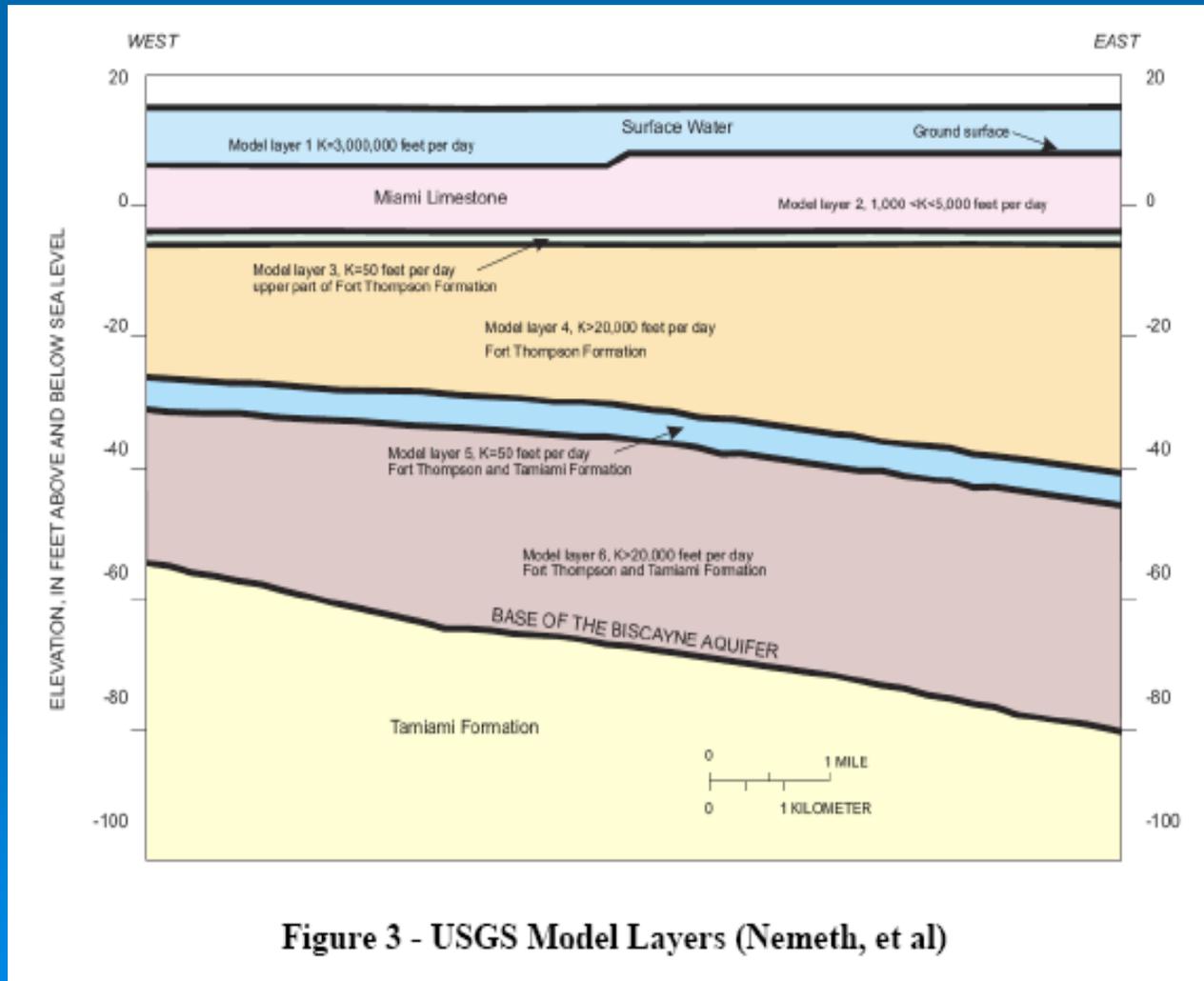
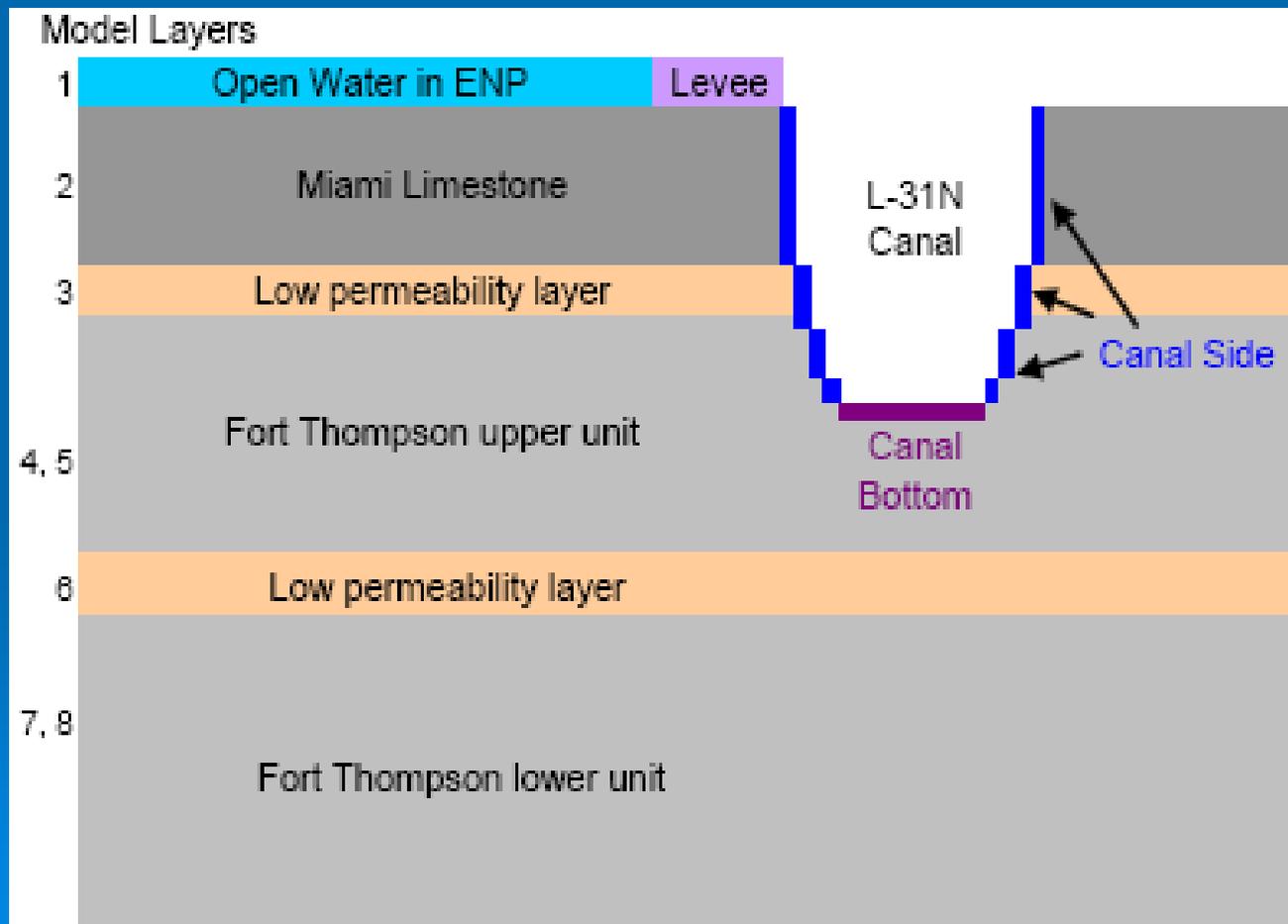


Figure 3 - USGS Model Layers (Nemeth, et al)

Aquifer Layers Vis-à-Vis L-31N Canal



Aquifer Permeability by Layer

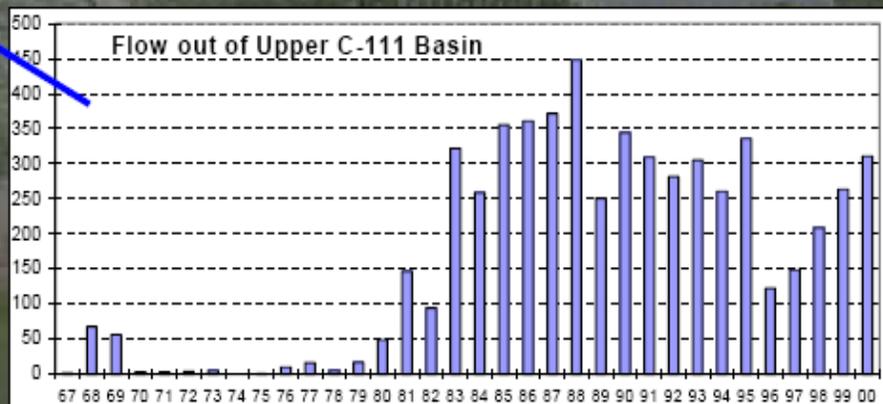
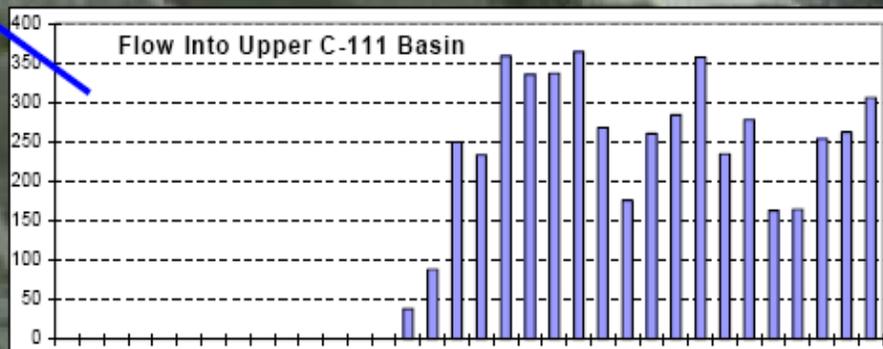
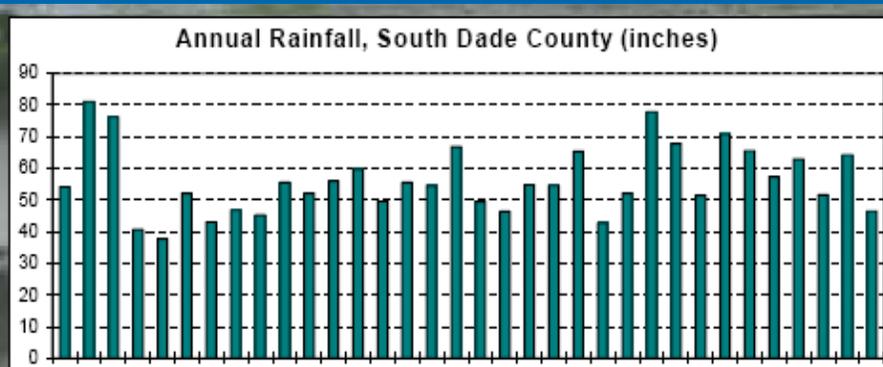
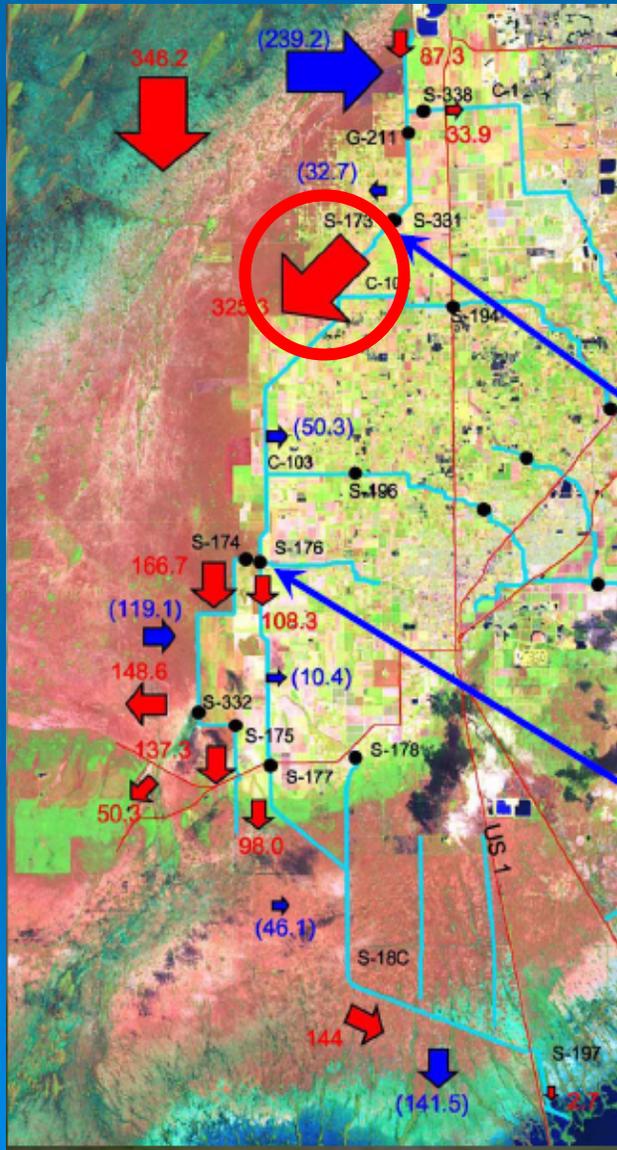
Aquifer Parameters for the Cross-Section Model

Model Layer	Nemeth Layer	K (ft/d)	Thickness (ft)	Bottom Elev (ft)	Material
1	1	3,000,000		5.0	Surface water in the ENP
2	2	3000-12,500	13.0	-8.0	Miami Limestone
3	3	50	2.0	-10.0	Low permeability layer
4	4	25,000	7.5	-17.5	Fort Thompson upper unit
5	4	25,000	7.5	-25.0	Fort Thompson upper unit
6	5	50	5.0	-30.0	Low permeability layer
7	6	25,000	10.0	-40.0	Fort Thompson lower unit
8	6	25,000	10.0	-50.0	Fort Thompson lower unit

* Nemeth, et al., 2000. USGS Water Resource Investigation Report 00-4066.

Very High Permeability

The "Big Red Arrow" (MacVicar-3/8/04)



Result of the
“Big Red
Arrow”

...

Increased
Flooding in
Miami-Dade
County



Seepage

Constraint: Increased Flows
Through the Everglades
Cannot Be Achieved Until
the Seepage Challenge Is
Adequately Addressed

CONSTRAINT #4:

WATER QUALITY



Water Quality

Judge Gold 2008 Order

- **10 ppb Phosphorus confirmed as the Criteria for the Everglades**
- **December 31, 2006 Settlement Agreement deadline for the discharge of clean water to the Everglades was not met, i.e. "... the deadline for compliance was not met. Instead the Florida Legislature simply changed the deadline for compliance." (p32) ... and there is no certainty under the State's Rule that the deadline will ever be met**

Water Quality

- All STAs consistently discharging above 10ppb ... as high as 93ppb for STA 6 in Water Year 2009 ... and this does not include Bypass Flows
- Rehydration with Dirty Water causes Irreversible Damage

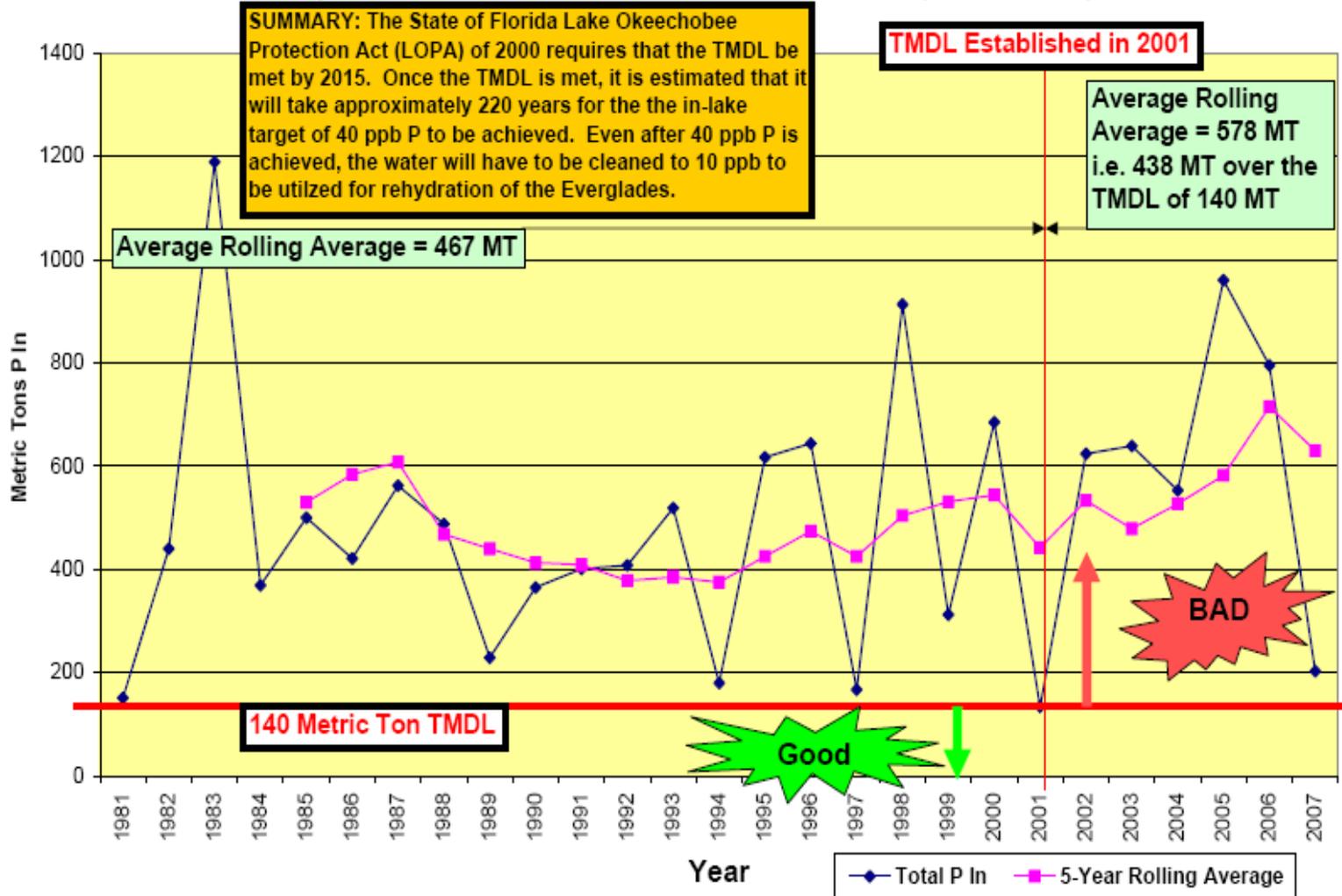
Water Quality

Constraint 4A: The Tribe
Will Never Support the
WCAs Being Utilized As
STAs ... Discharges Into
the Everglades Must Meet
the P Criterion of 10 ppb

Water Quality

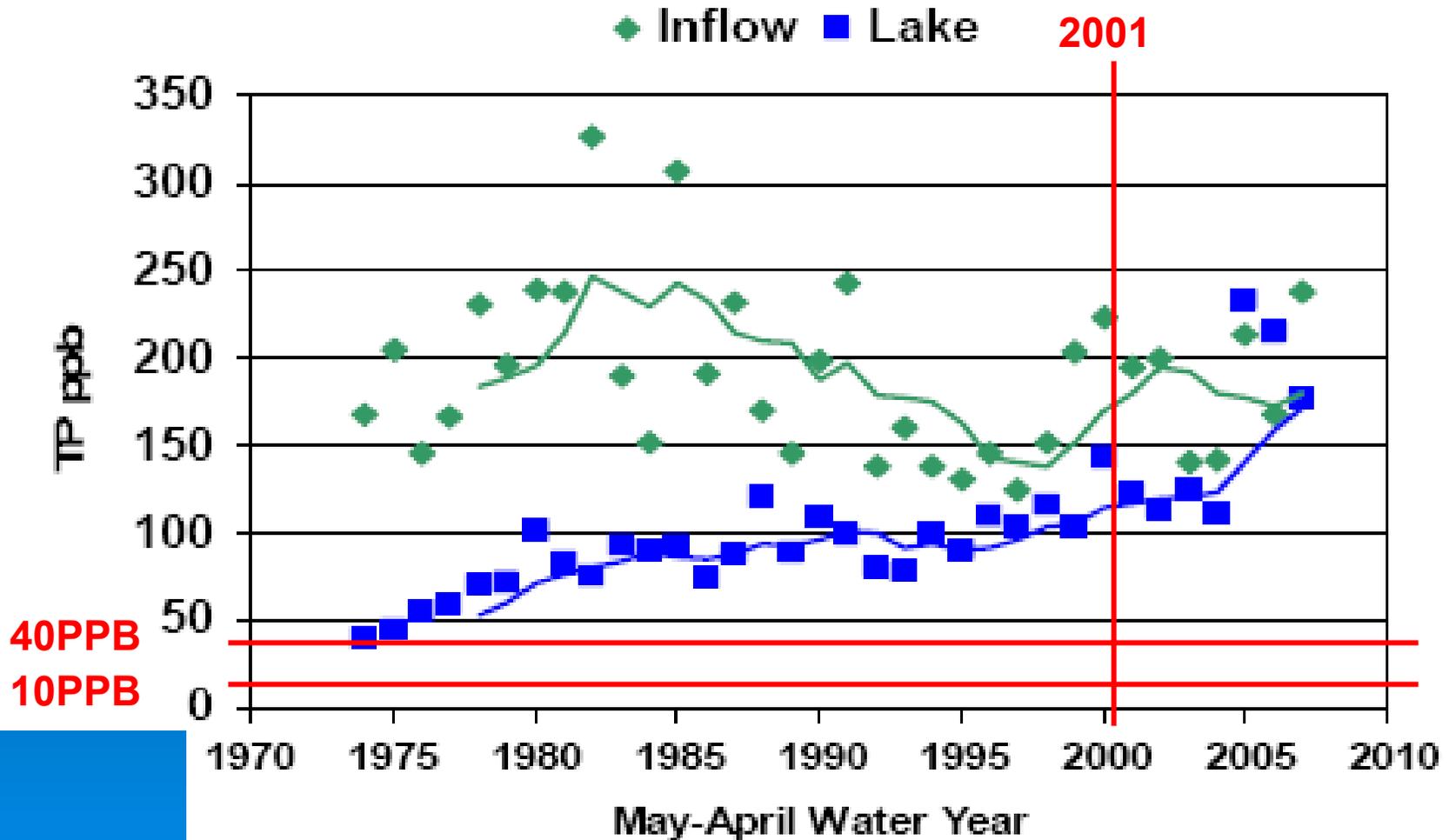
The Elephant in the Room ... Lake O

Phosphorous Loads into Lake Okeechobee (1981-2007)



Water Quality

Lake O Phosphorous Concentrations



Water Quality Lake Okeechobee

Recent water quality restoration initiatives in the Northern Everglades are not likely to achieve the stated water quality goals (40 ppb total phosphorous in the lake and 140 metric tons per year phosphorous input load) by the year 2015, and it might take decades for these goals to be met with current strategies.

From CISRERP (NAS) 2008 Report - Lake Okeechobee Conclusions & Recommendations (summary statements pp 186-188)

Water Quality Lake Okeechobee

Constraint 4B: Restoration Can
Never Be Effective Without a
Clean Lake O ... the Current
Strategy Is Totally Inadequate
and the ROG Acquisition Only
Exacerbates a Bad Situation By
Diverting Focus & Resources

Water Quality

Dealing with All the Water

An integrated, system-wide view of water quality management is essential to the achievement of restoration goals for the South Florida ecosystem.

From CISRERP (NAS) 2008 Report - Lake Okeechobee Conclusions & Recommendations (summary statements pp 186-188)

Water Quality

Dealing with All the Water

Constraint 4C: There is no

“integrated, system-wide view of water quality management”

which *“is essential to the*

achievement of restoration goals

for the South Florida

ecosystem.”

Water Quality

Constraint: The Tribe Will Not Support Any Plan That Rehydrates the Everglades With Dirty Water ... the WCAs Will Not Be Utilized As STAs

CONSTRAINT #5:

ENDANGERED SPECIES



Endangered Species Challenges

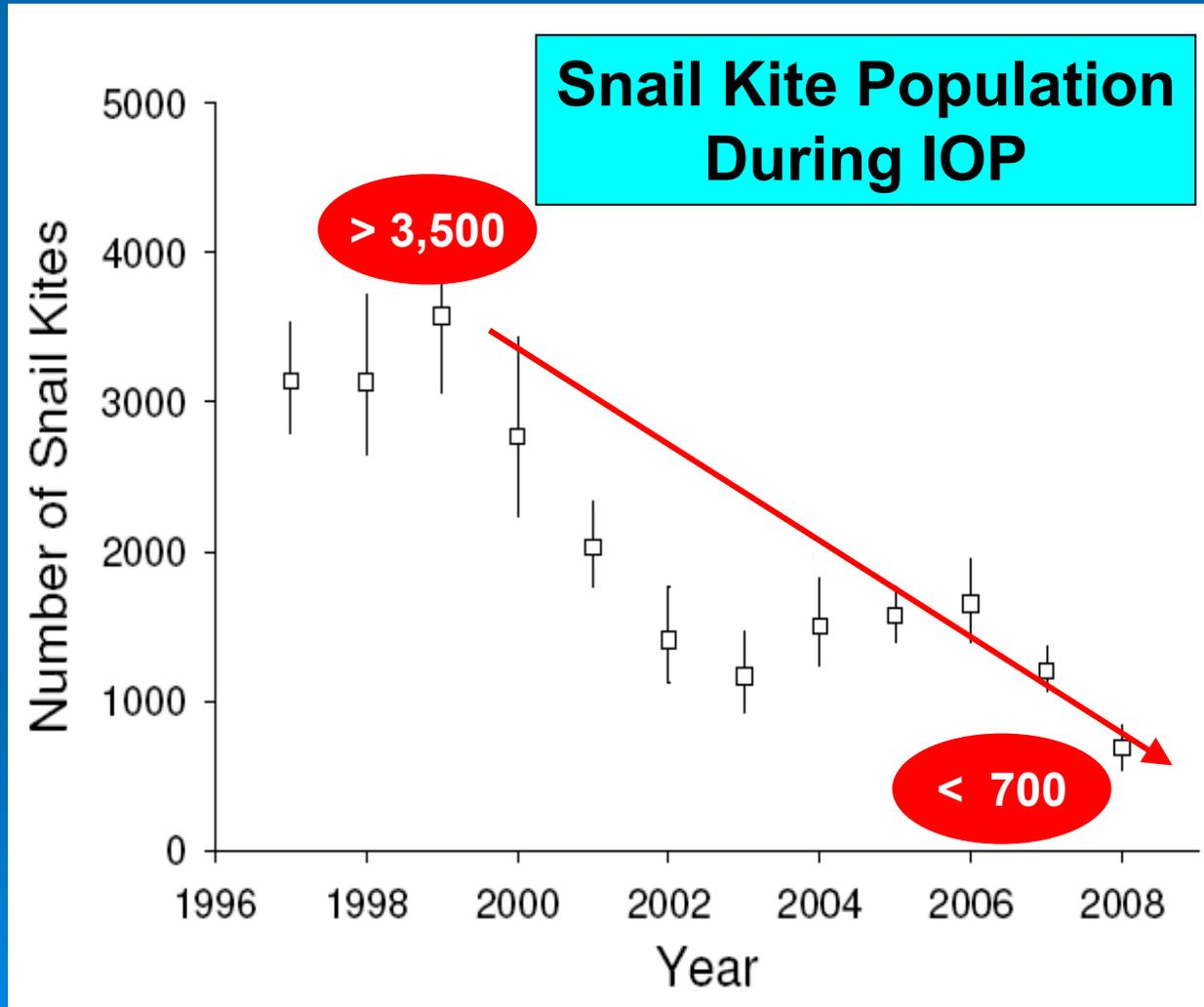
- Competing “Endangered” Species
 - Single-Species Management
 - “Critical Habitat” Designations
 - “Jeopardy” Determinations
 - Major Changes in Hydrology
 - Habitat Shifts
- 

Endangered Species

“Emergency water management for the Cape Sable seaside sparrows under the interim operational plan (IOP) illustrates the failure of species-by-species management. The resulting water regimes have led to unwanted flooding of tribal lands and probably have contributed to declines of snail kites and tree islands in WCA 3A.”

*Progress Toward Restoring the Everglades,
The Second Biennial Review, CISRERP, 2008*

Endangered Species



Endangered Species

Constraint: Multi-Species
Recovery Requires That a
Multi-Species Transition
Plan Be Overlaid on the
Restoration Flow Plan

Storage

CONSTRAINT #6:

STORAGE

The background features several sets of concentric circles in a lighter shade of blue, resembling ripples in water, positioned in the lower right quadrant of the slide.

Storage

Storage Alternatives Include:

- Shallow Surface Storage ... STAs (1-2 ft)
- Shallow Storage ... Flow-Way (1-3 ft)
- Shallow Surface Storage (4-10 ft)
- Deep Storage (11-18 ft)
- ASR

Storage Challenge

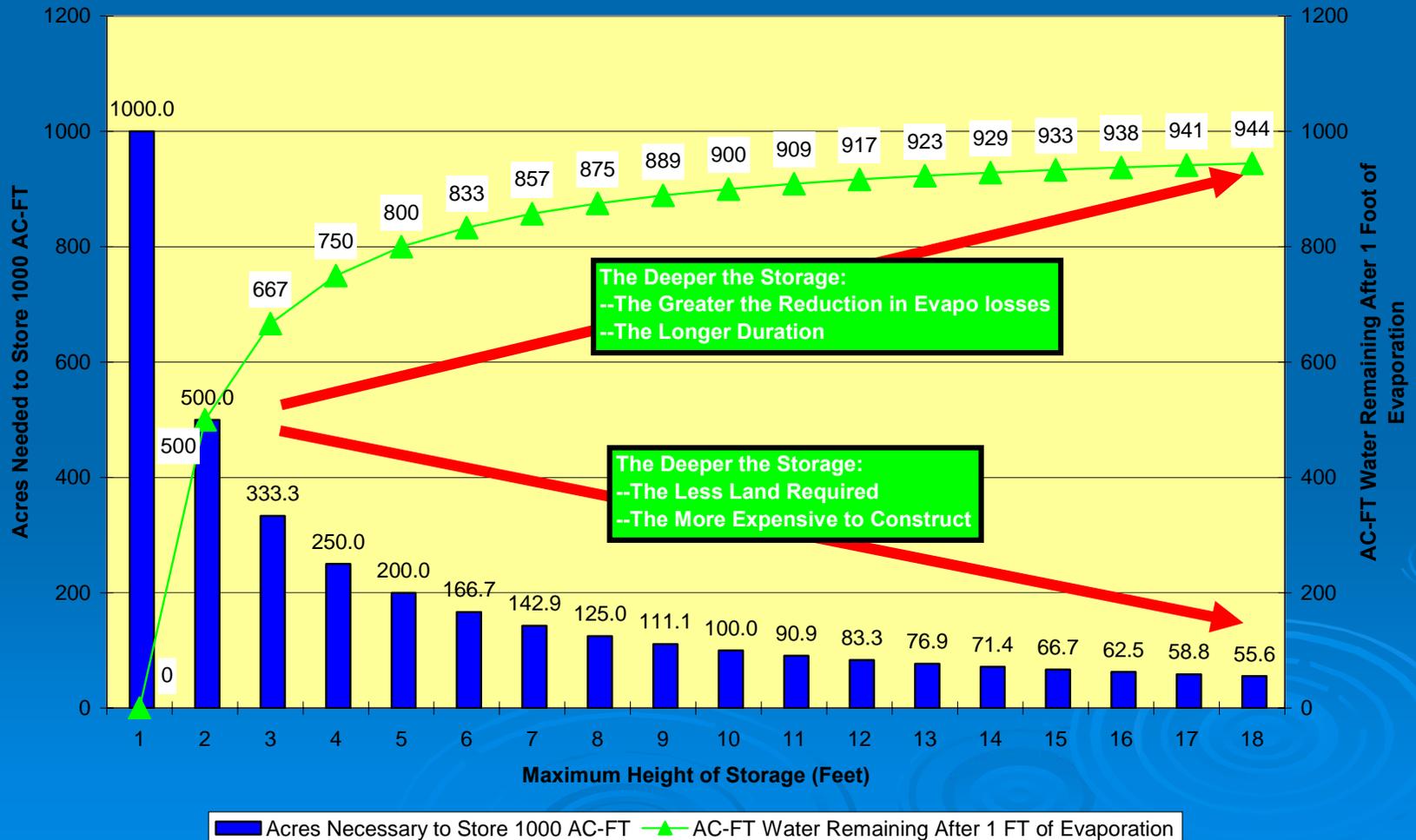
Storage Alternatives are not fungible ... must choose the Right Combination of Storage Alternatives considering at least:

- Objectives
- Water Quality
- Duration (the more the Evapotranspiration & Seepage, the less time the water is available)
- Land Requirements &/or Availability
- Costs

TO ACHIEVE THE DESIRED BENEFITS

Shallow v. Deep Surface Storage

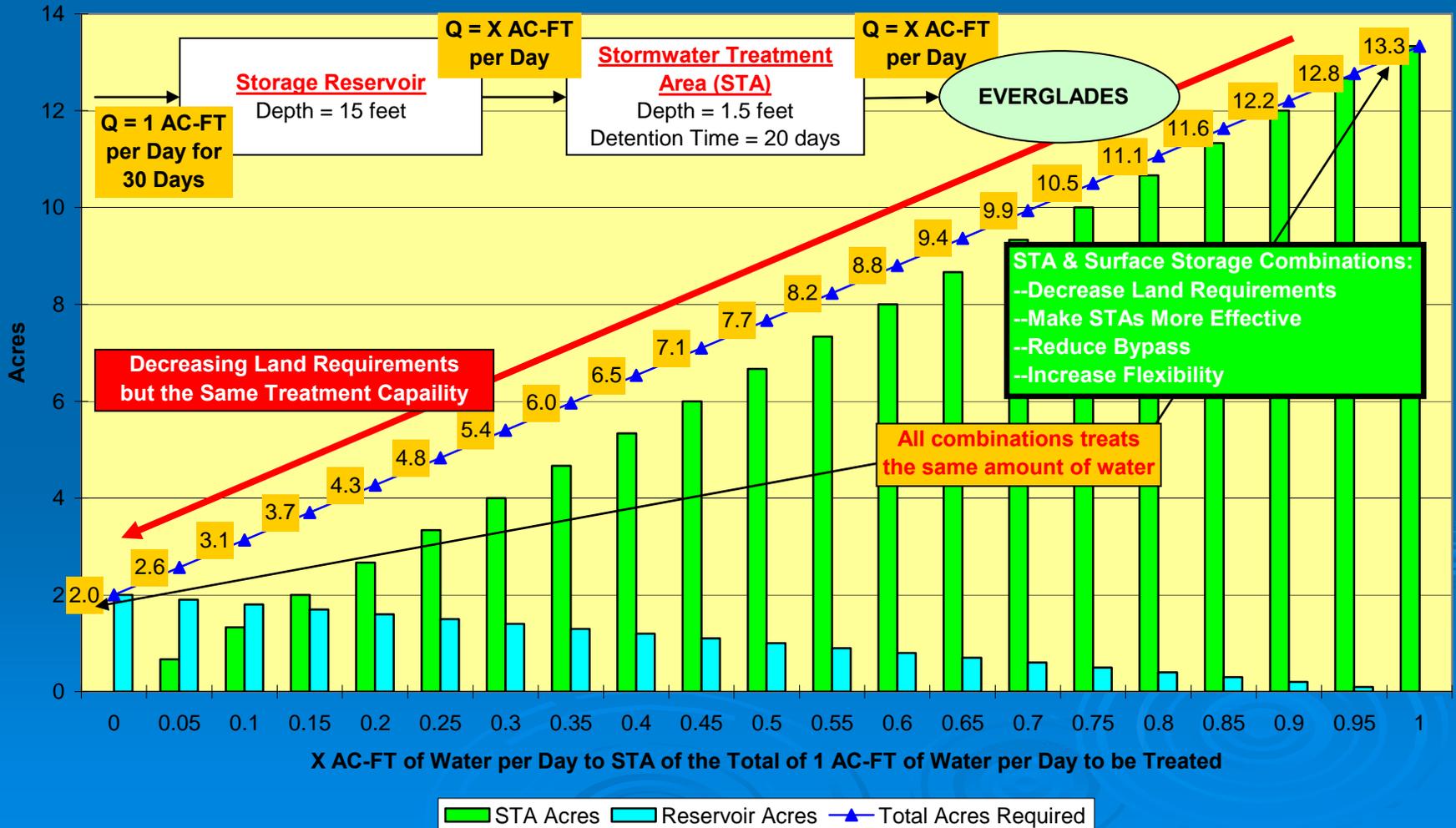
Surface Storage Only
Example of Pro's & Con's of Shallow v. Deep Storage



STAs & Surface Storage

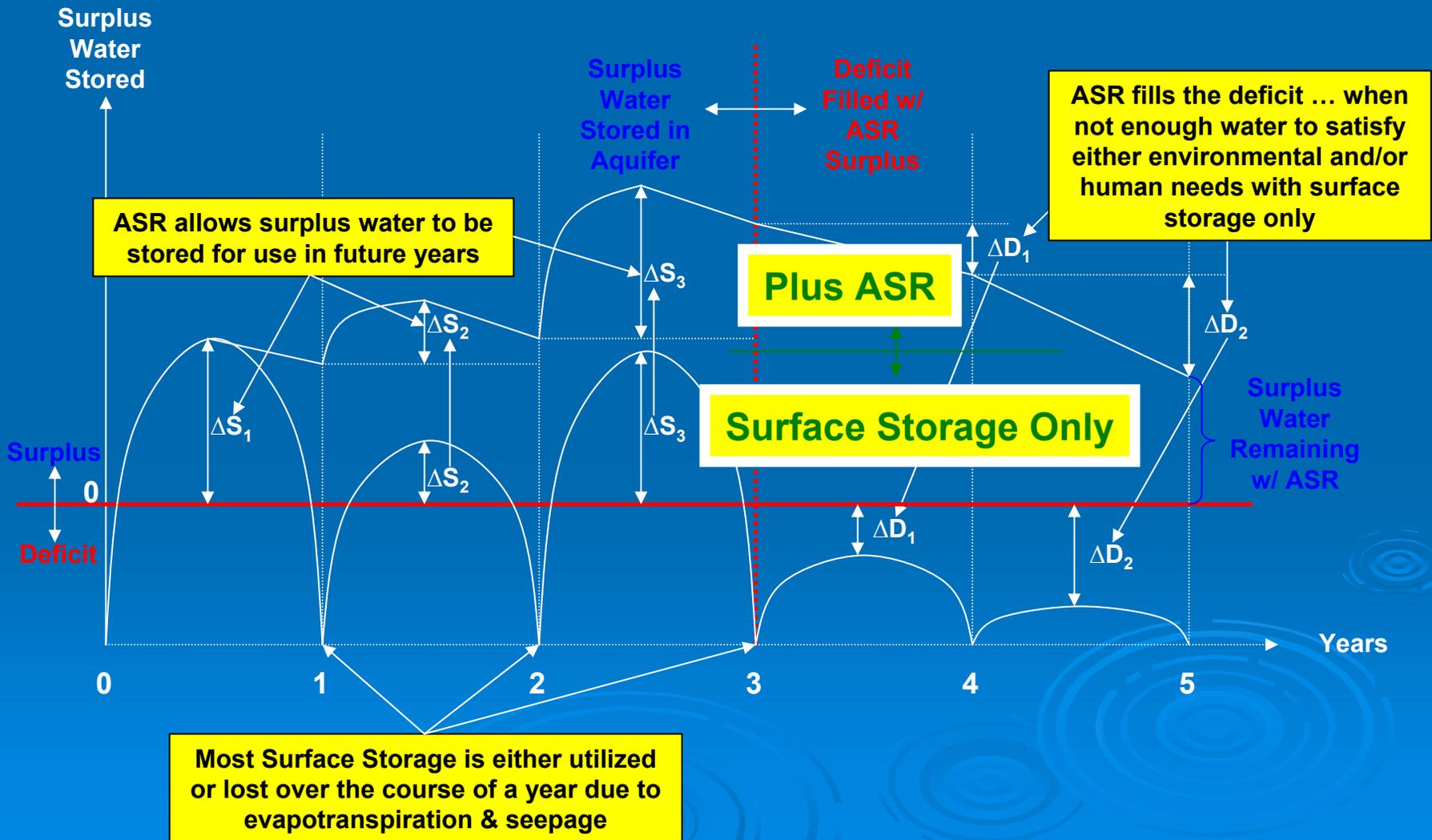
Surface & STA Storage

Example of Pro's & Con's of Different Combinations of Surface & STA Storage
 Design Event Scenario: 1 AC-FT Per Day for 30 Days



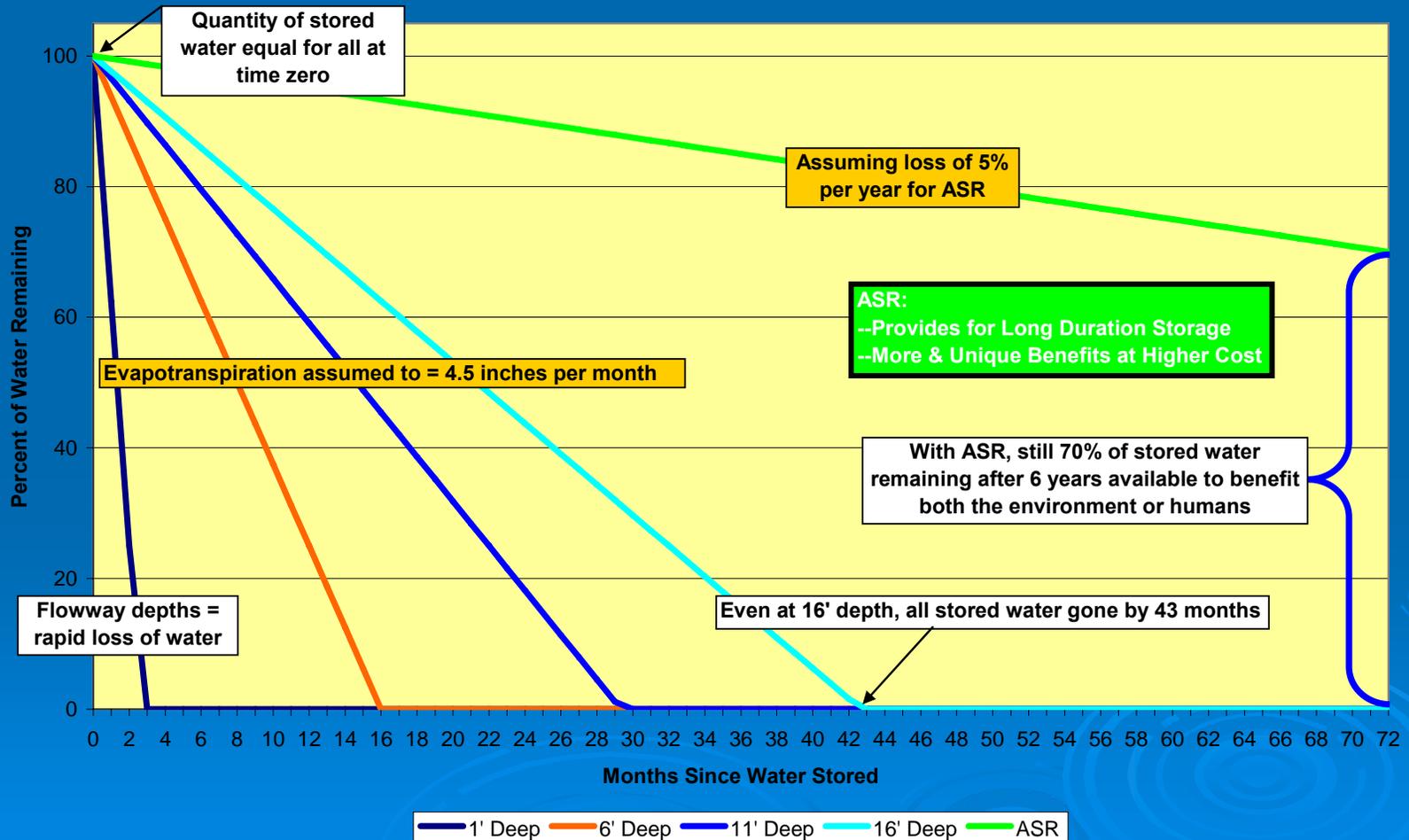
Surface Storage v. ASR

Why surface storage does not substitute for ASR ...
each has its unique benefits which are not fungible



Surface Storage v. ASR

Surface Storage & ASR
Example of Pro's & Con's of Surface Storage v. ASR



Storage

Constraint: If Storage
Decisions Are Not Made
Based on Scientific &
Engineering Principles, the
Desired Benefits Will Not Be
Achieved ... the Tail Cannot
Wag the Dog

The Bottom Line Constraint:

No Unity of Effort ... the
Pursuit of the

Unnecessary, Unreasonable,
and Impossible

Prevents the Achievable ...
and the Everglades Continues
to Be Irreversibly Destroyed