SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Kissimmee Basin Water Reservation Rule Development Update

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Water Resource Advisory Commission

March 5, 2009

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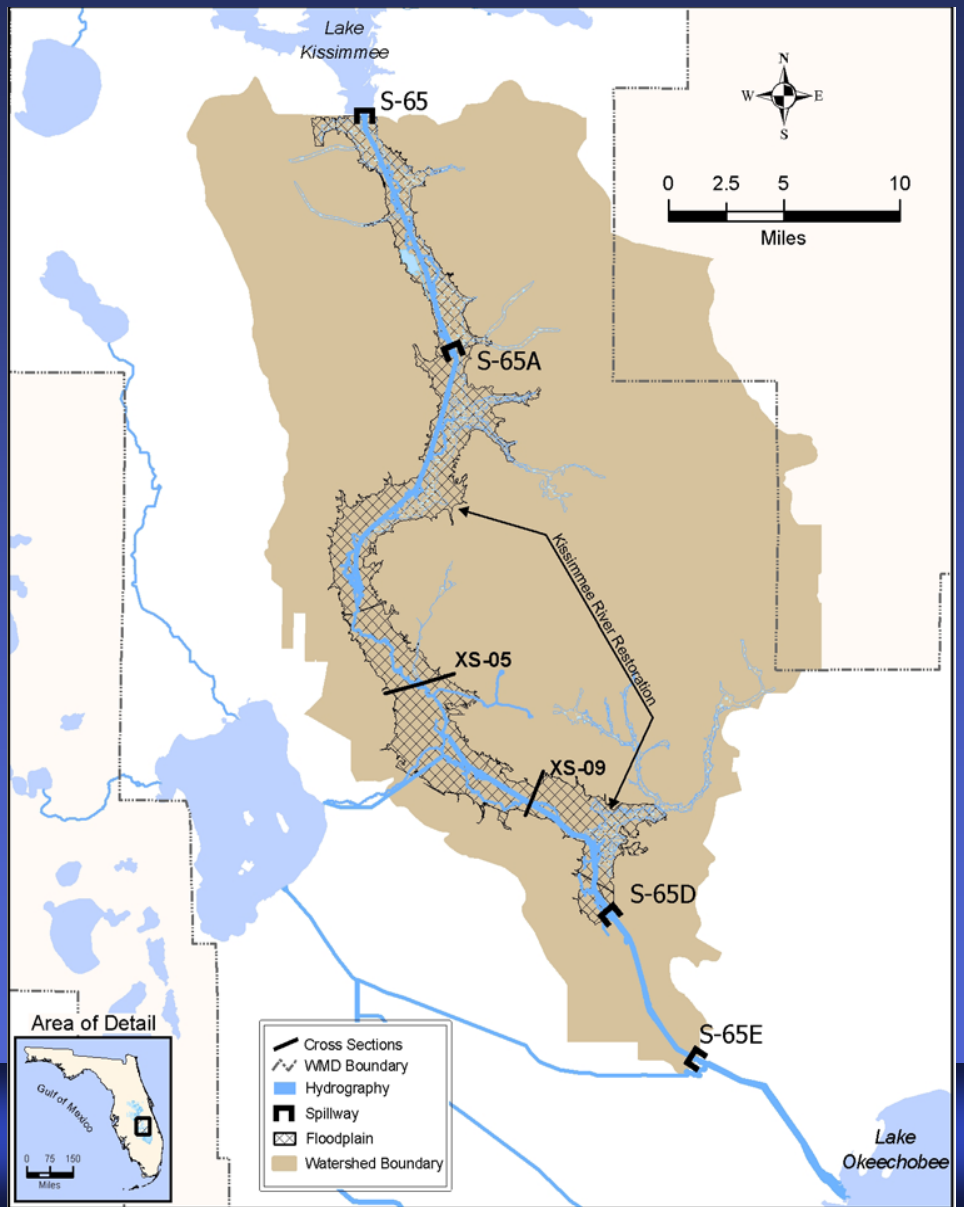
Objectives of Today's Presentation

- Describe assumptions and results of the technical evaluations conducted to date
  - River
  - Kissimmee Chain of Lakes
- Provide preliminary results of the waters needed for protection of fish and wildlife
- Identify additional analyses to be conducted
- Identify emerging policy challenges

Process for Defining Water to be Reserved

- Step #1: Identify the "Reservation Waterbodies"
- Step #2: Identify fish and wildlife species and habitat to be protected
- Step #3: Identify the 'with project base' hydrology (total water available)
- Step #4: Establish linkages between hydrology and biology (performance measures)
- Step #5: Identify water necessary for protection of fish and wildlife (water reservation)

Step 1: Reservation Waterbodies: Kissimmee River and Floodplain



- Restored Kissimmee River and floodplain (S-65 to S-65E)
- 103 miles of River and floodplain
- 27,000 acres wetland habitat

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Key Assumptions: Restored River

- Fish and wildlife to be protected based on restored river and floodplain
- Hydrology of pre-channelized condition protective of fish and wildlife
- Performance measures for reservation established through River Restoration process

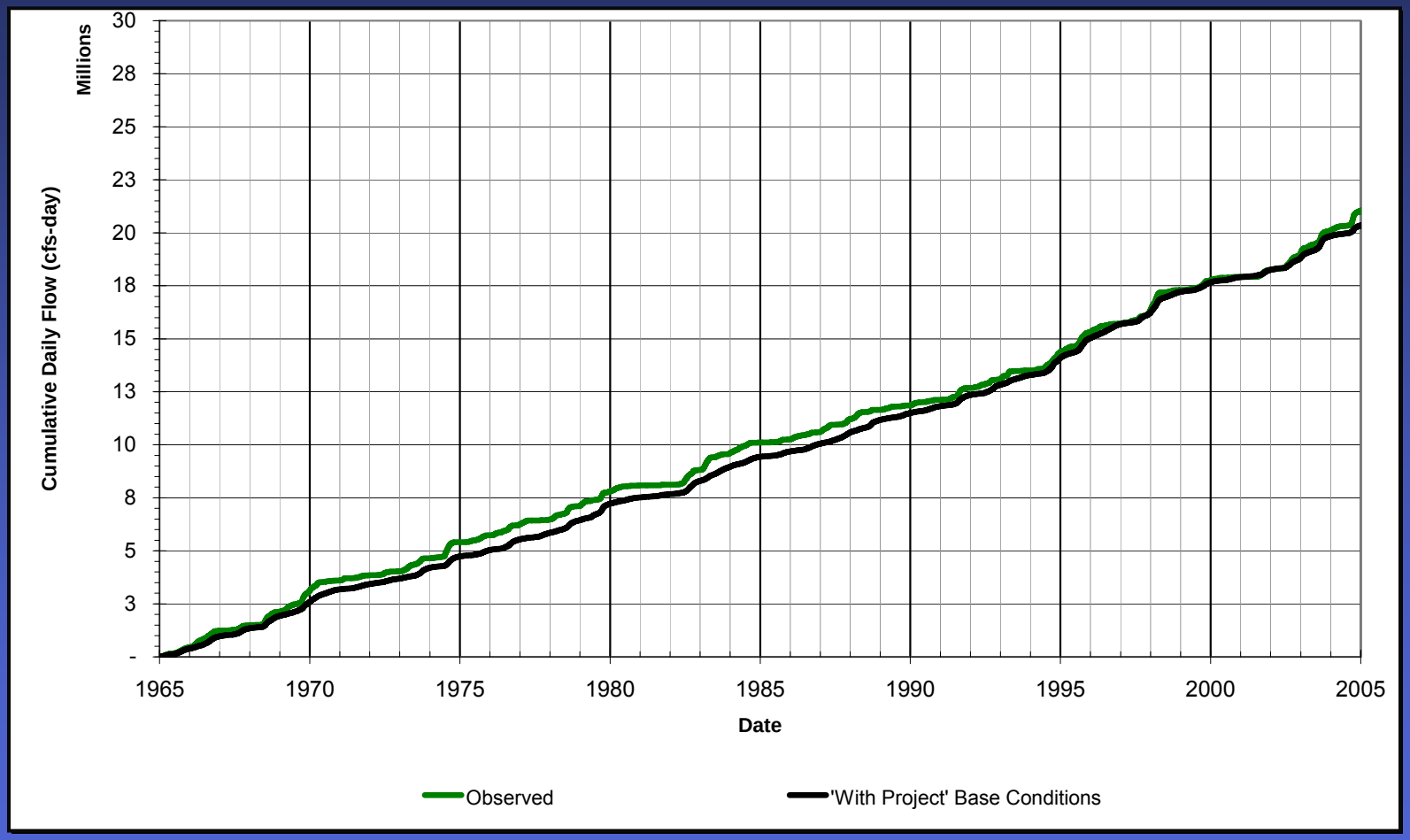
Step 2: Fish & Wildlife of the Kissimmee River and Floodplain

- Fish Community
  - 52 species of fish use the river channel or floodplain (includes 6 exotic species)
- Water birds
  - 68 species of wetland dependant birds
  - 14 species of wading birds including Federally endangered wood stork
  - 16 species of ducks
- Amphibians and Reptiles – 24 species
- Mammals – 4 species wetland river/dependent

Step 3: Identify the 'with project base' hydrology

- The modeling tools have undergone a series of calibration and verification
- Modeling tools have been peer reviewed
- Peer review comments have been incorporated and the integrated model undergone a rigorous re-calibration process
- The modeling tool has been verified against the most sensitive parameter: Runoff

Step 3: 'With project base'; Cumulative Basin Discharge



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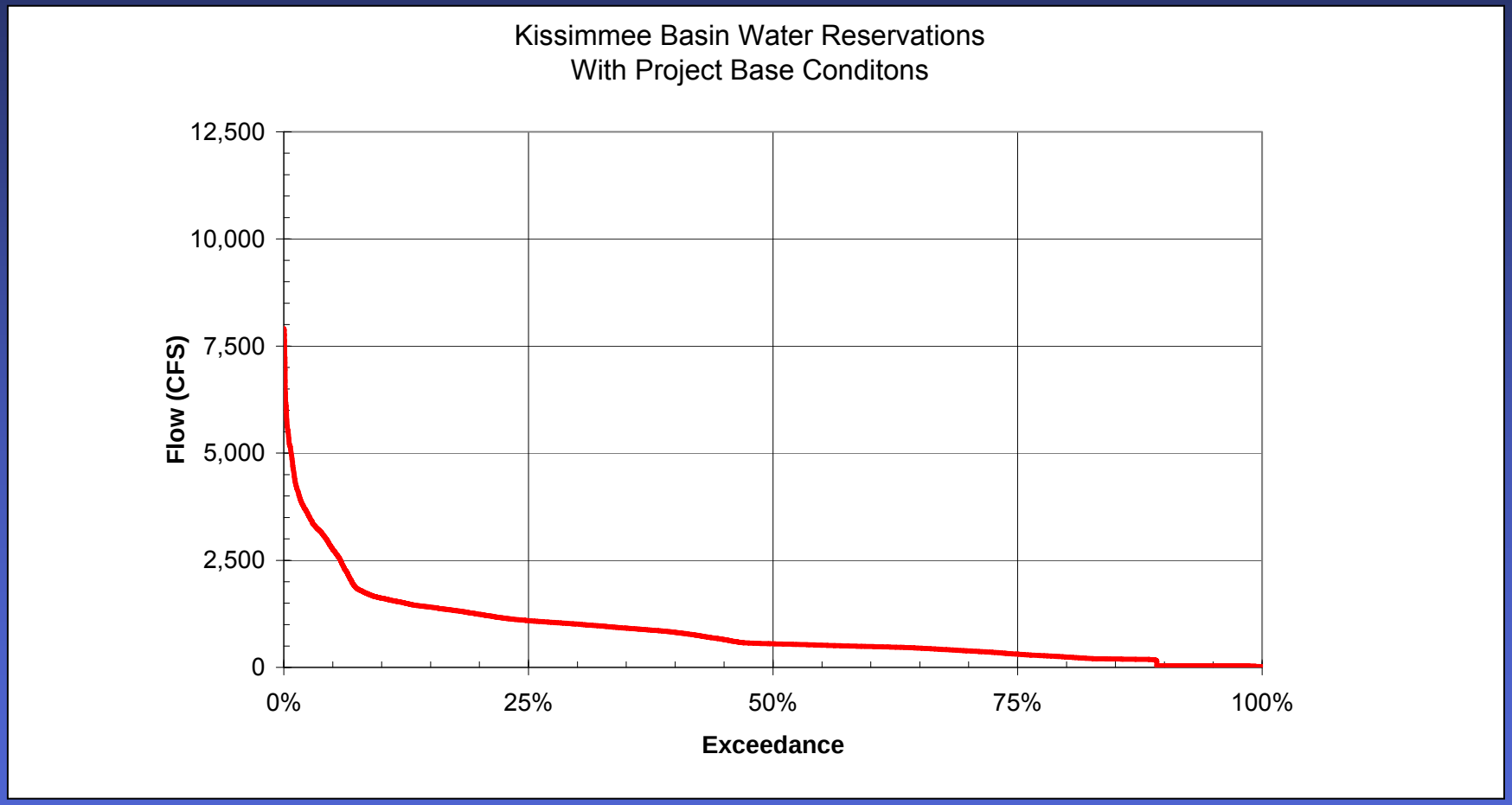

Step 4: Linkages Between Hydrology and Biology

- Defined through use of performance measures linking hydrology to biologic response
- Best available data
  - Restoration demonstration project studies
  - Interim responses to Phase I of the restoration project
  - Analysis of pre-channelization stage and flow data
  - Literature review

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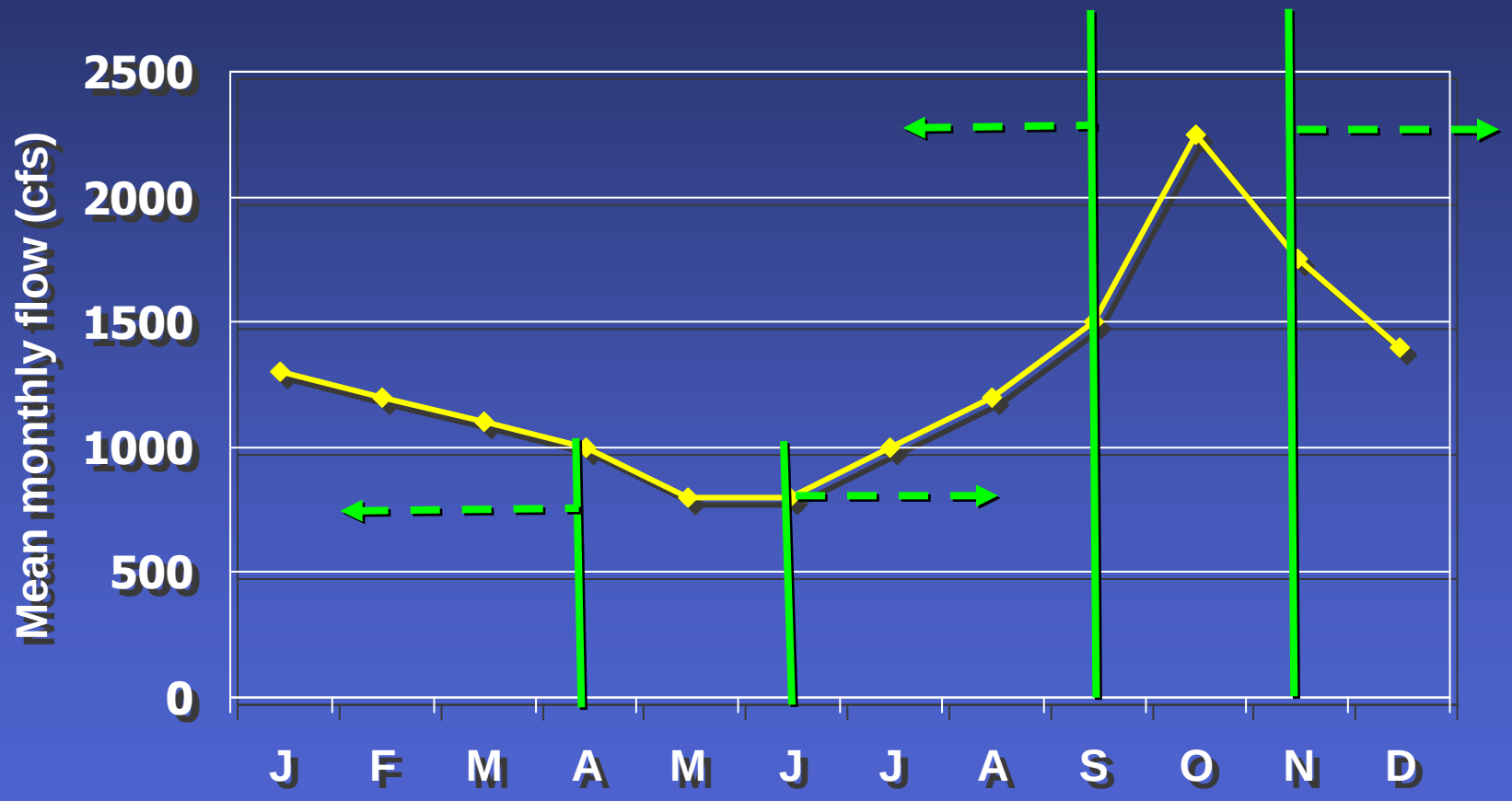
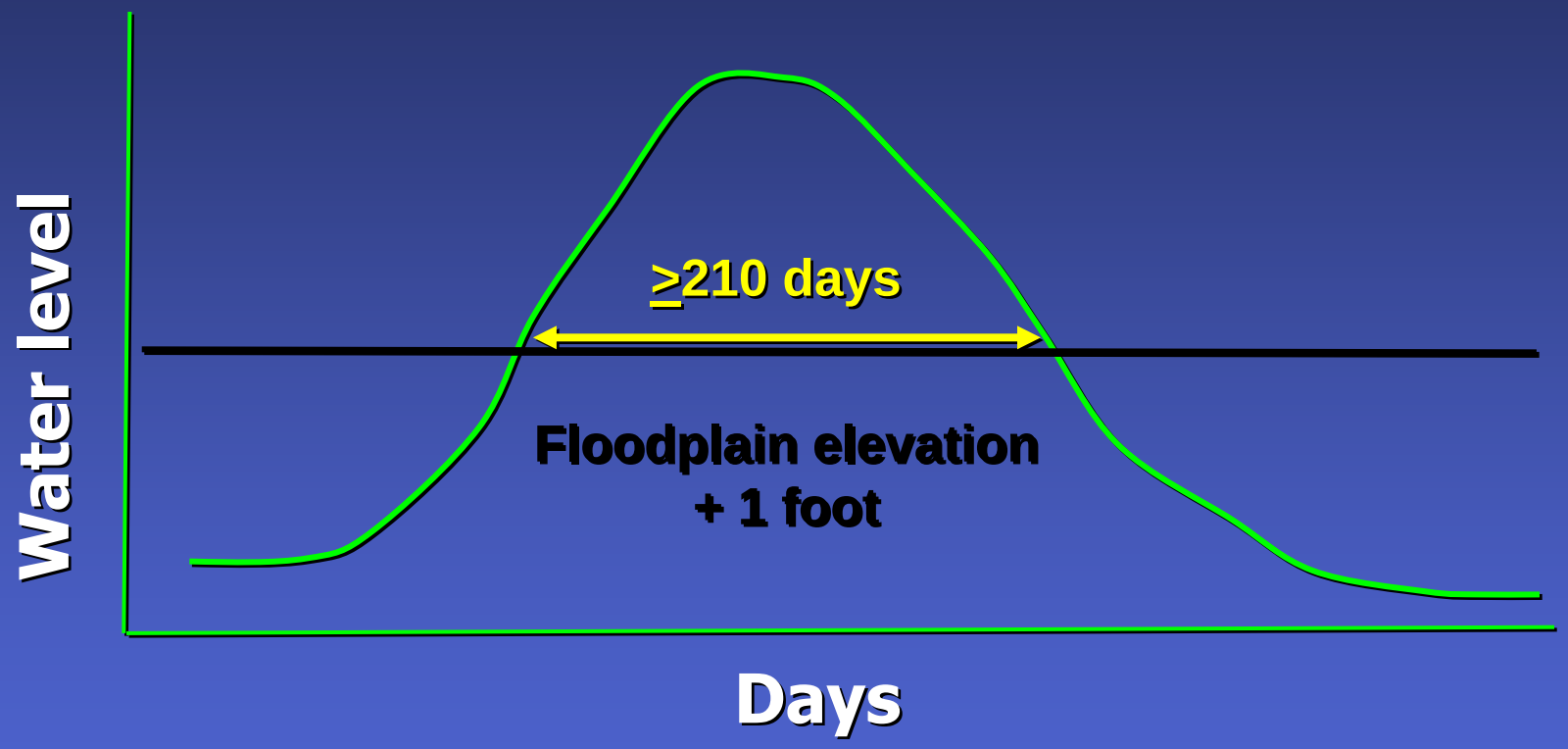
Performance Measures Used to Describe Fish and Wildlife Hydrologic Requirements

- R-01 Kissimmee River Flow
  - Seasonality
- R-02 Stage Hydrograph/Floodplain Hydroperiod
  - Hydroperiod for Broadleaf Marsh
  - Intra- and Inter-annual variability of water levels
- R-03 Water Level Recession
  - Rate of water level decreases
  - Frequency of large water level reversals

R-01 Seasonality of Flow



R-02 Hydroperiod & Water Level Variability



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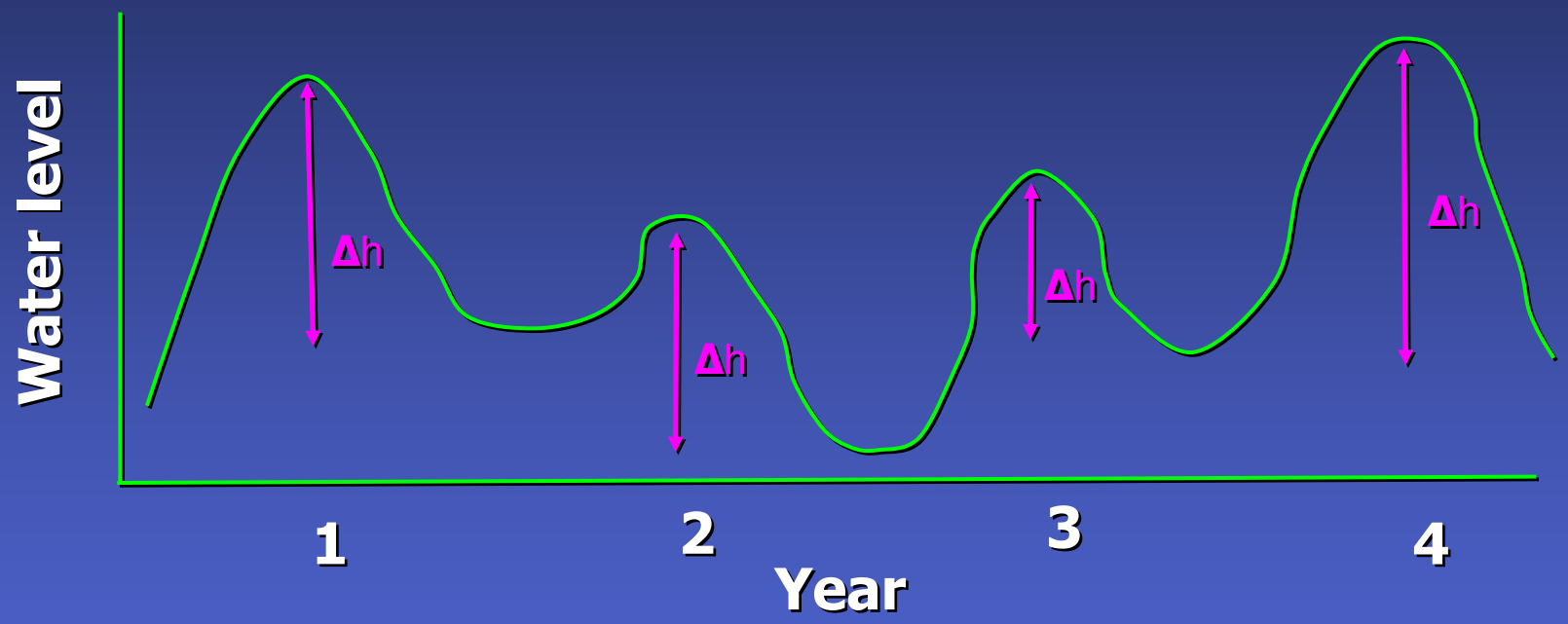
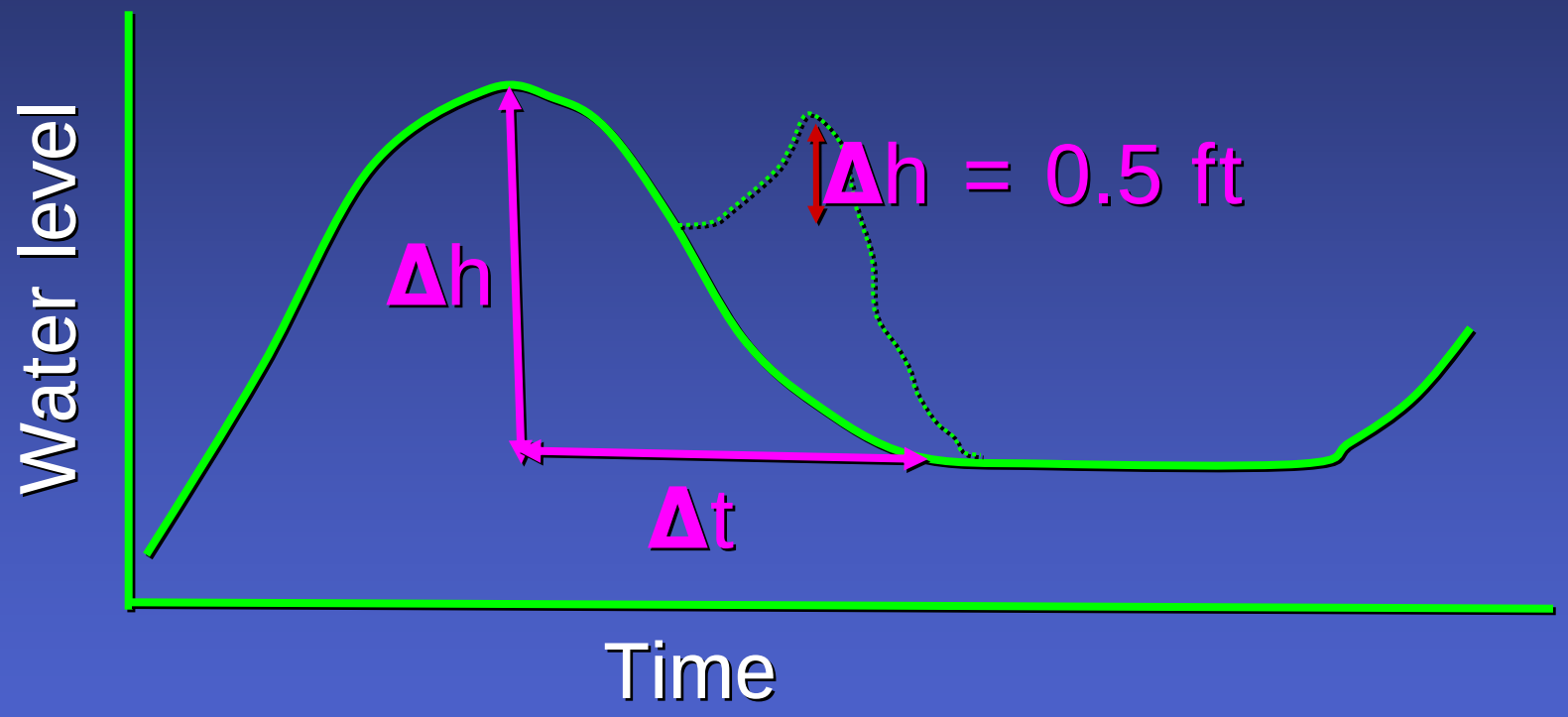


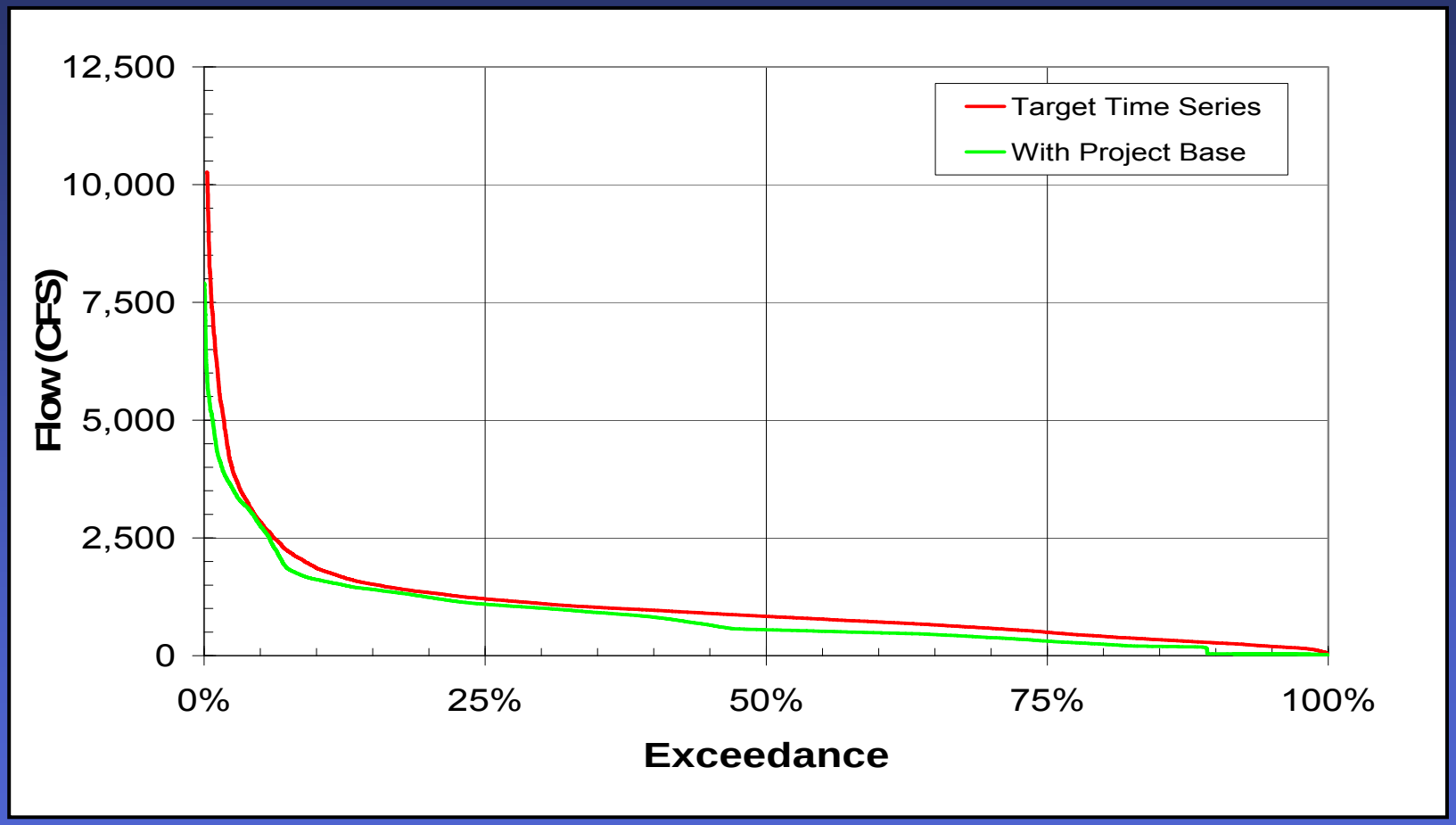
Δh = maximum h – minimum h for a calendar year
Intra-annual variability = average of Δh
Inter-annual variability = standard deviation of Δh

R-03 Water Level Recession



Recession rate = Δh/Δt x 30 days

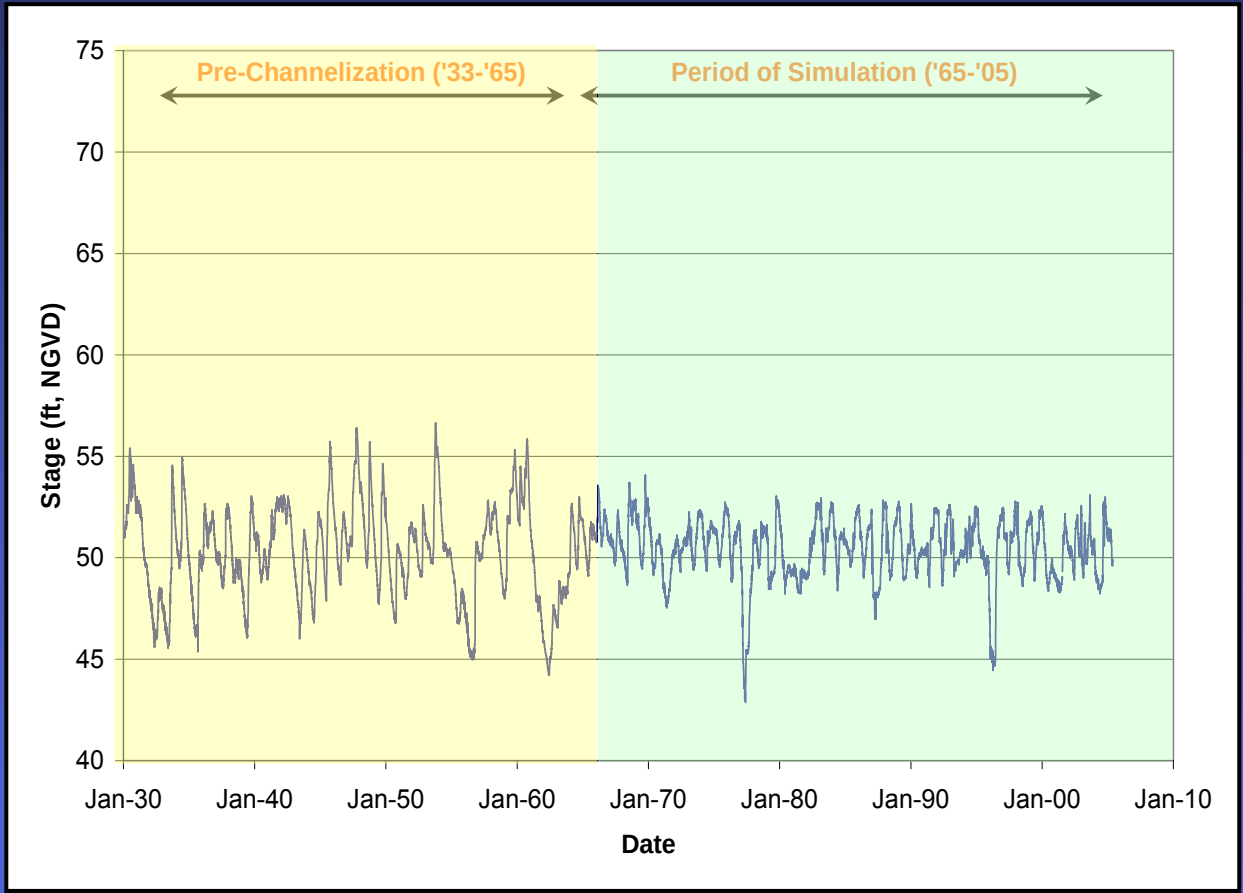
Step 5: Comparison of Kissimmee River Target Time Series And With Project Base Inflows at S-65



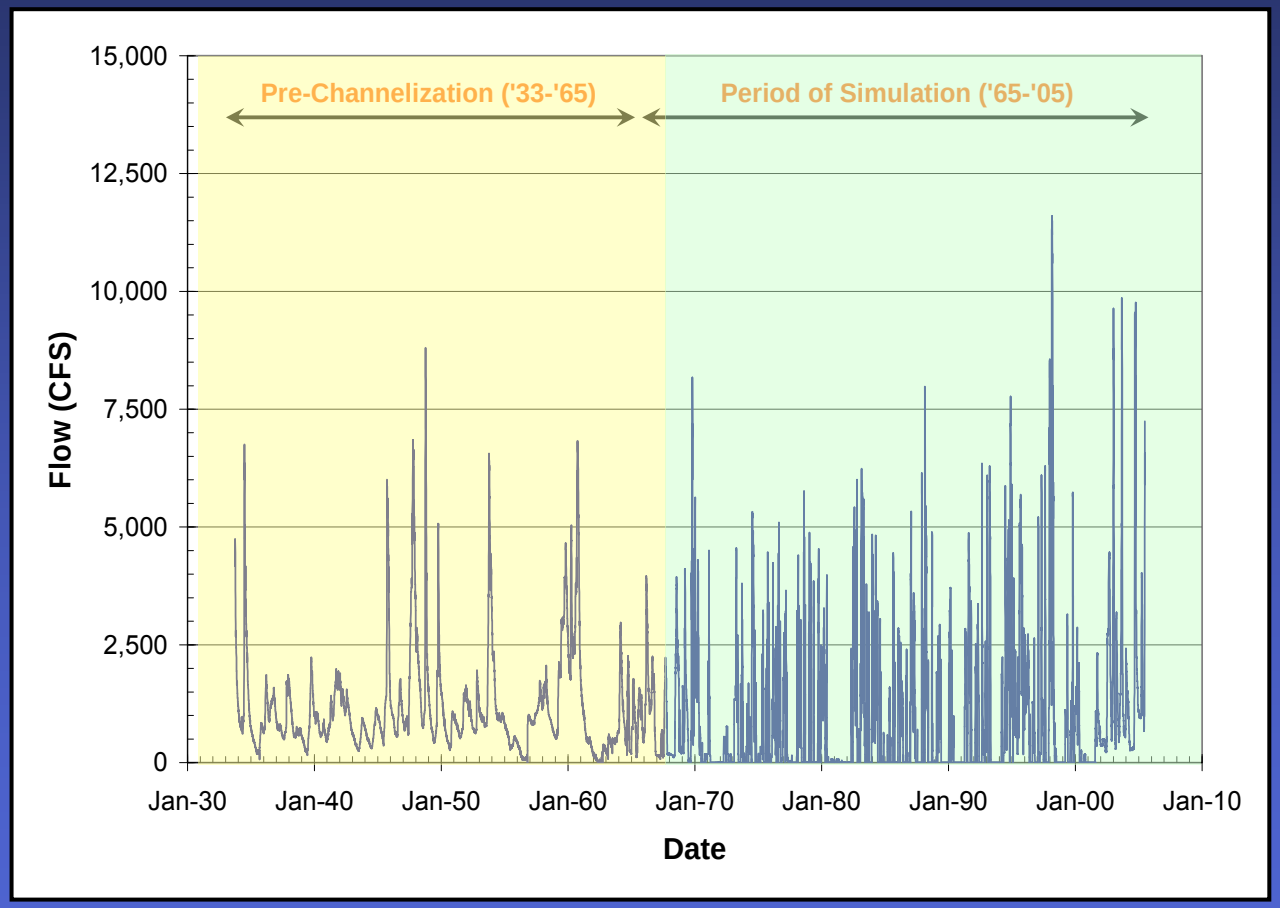
Understanding Where the Water Went

- The preliminary results show that the With Project Base Condition does not have sufficient water to meet the needs of fish and wildlife in the restored Kissimmee River and Floodplain
- What has changed from the pre-channelization conditions?
  - The results can be influenced by:
    - The modeling tools
    - Hydrology and hydraulics in the Kissimmee Basin
    - Climate

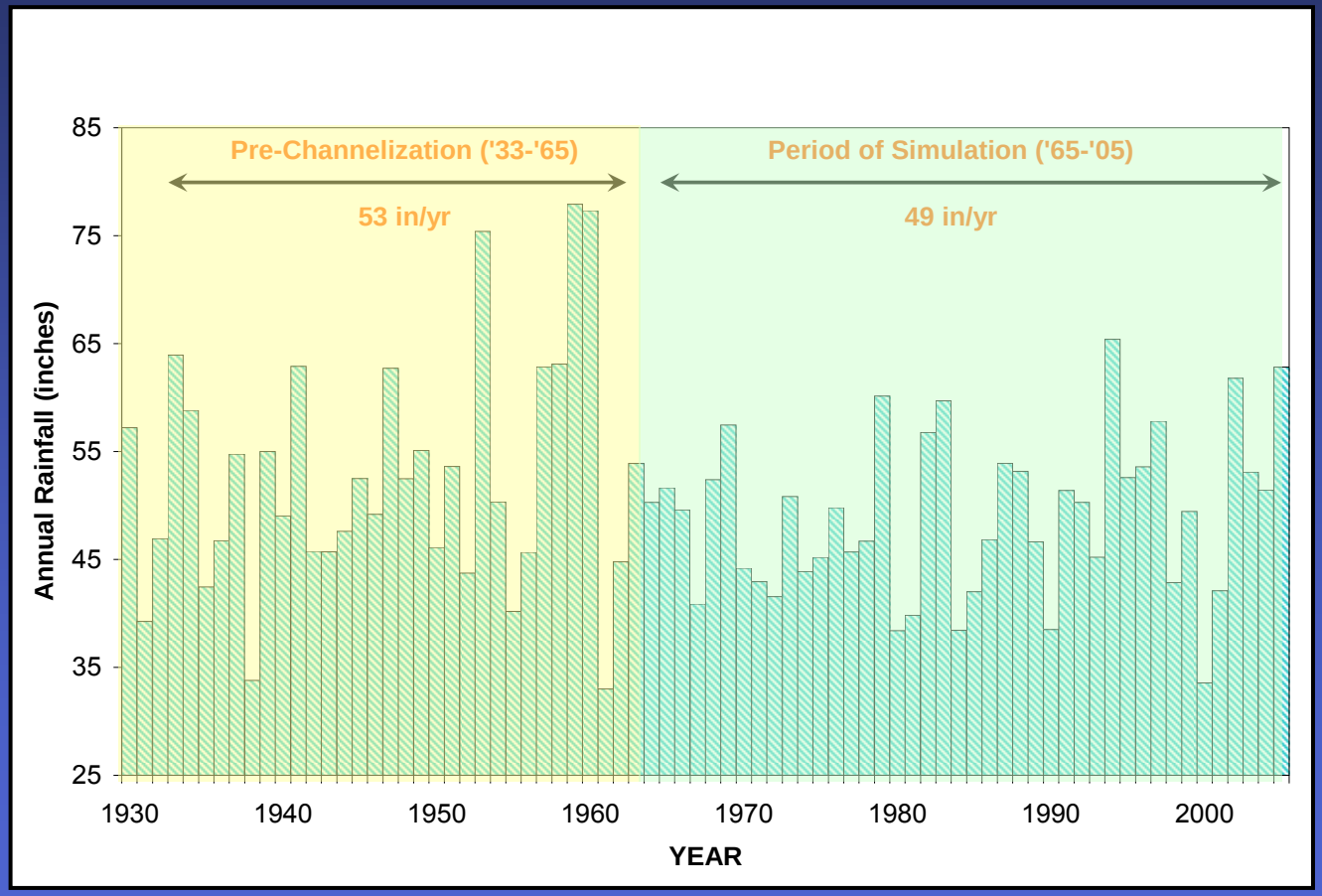
Historic Stage in Lake Kissimmee



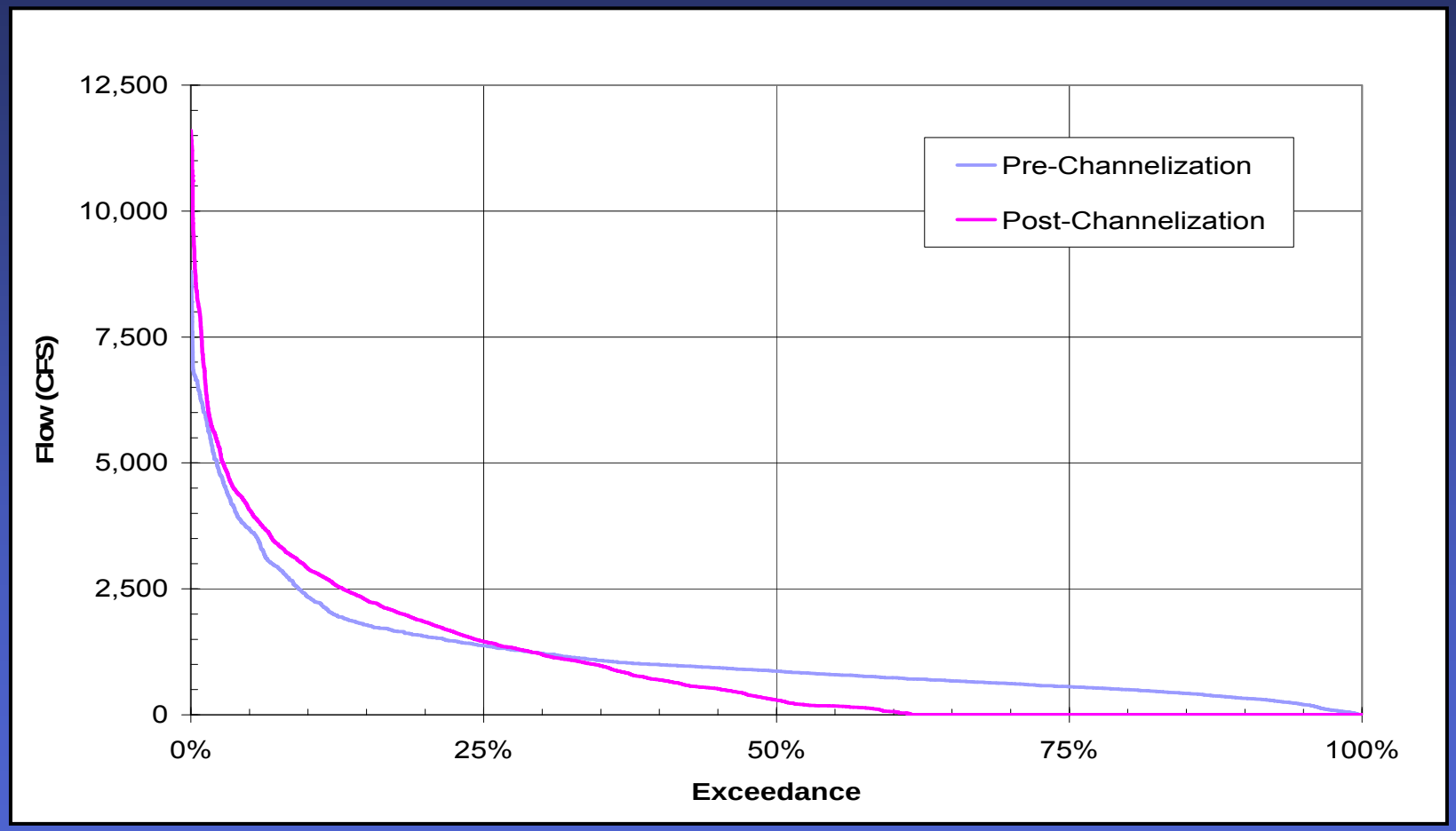
Historic Flow From Lake Kissimmee into the Kissimmee River



Pre- and Post-Channelization Rainfall



Comparing the Pre- and Post-Channelization Flows at S-65



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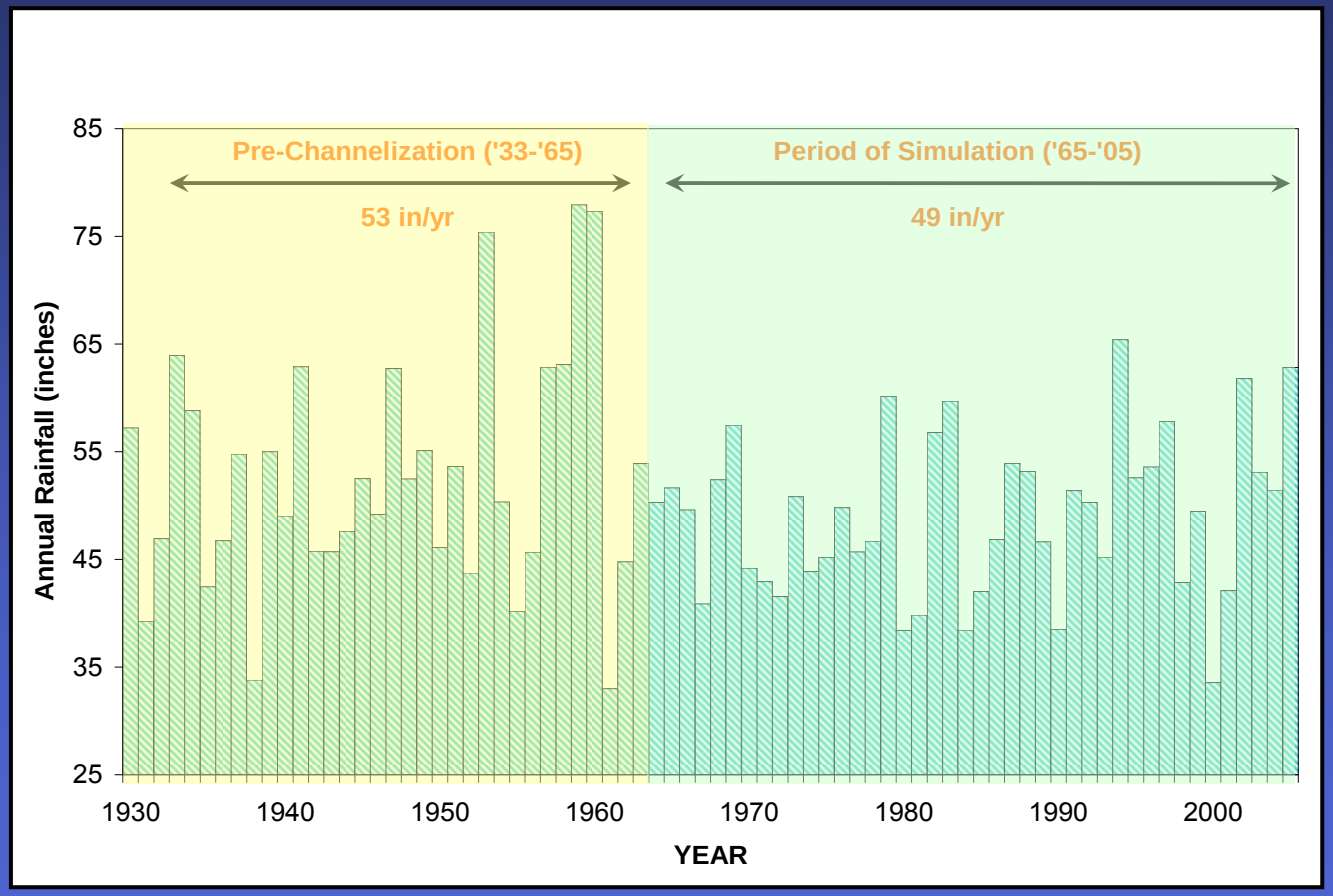

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Hydrologic Comparison of Observed Rainfall and Flows

Timeframe	Years	Average Annual Discharge		Average Rainfall
		CFS	kAF	
Period of Analysis	’33 – ’05	1,070	775	51
Pre-Channelization	’33 – ’64	1,185	860	53
W/Project Base	’65 – ’05	980	710	49
Target Time Series*	’65 – ’05	1,076	780	

* - Hypothetical Time Series

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River Conclusions

- The water required for the protection of fish and wildlife:
  - Is based on a set of River Performance Measures that are consistent with the Kissimmee River Restoration Project
  - Has been developed using modeling tools that have been calibrated, verified and undergone Peer Review
  - The quantity of water required for the protection of fish & wildlife is consistent and within the range of observed flows over the past 70 years
- Based on the preliminary results, all water in river (inflows at S-65 and outflows at S-65E) is required for the protection of fish and wildlife.

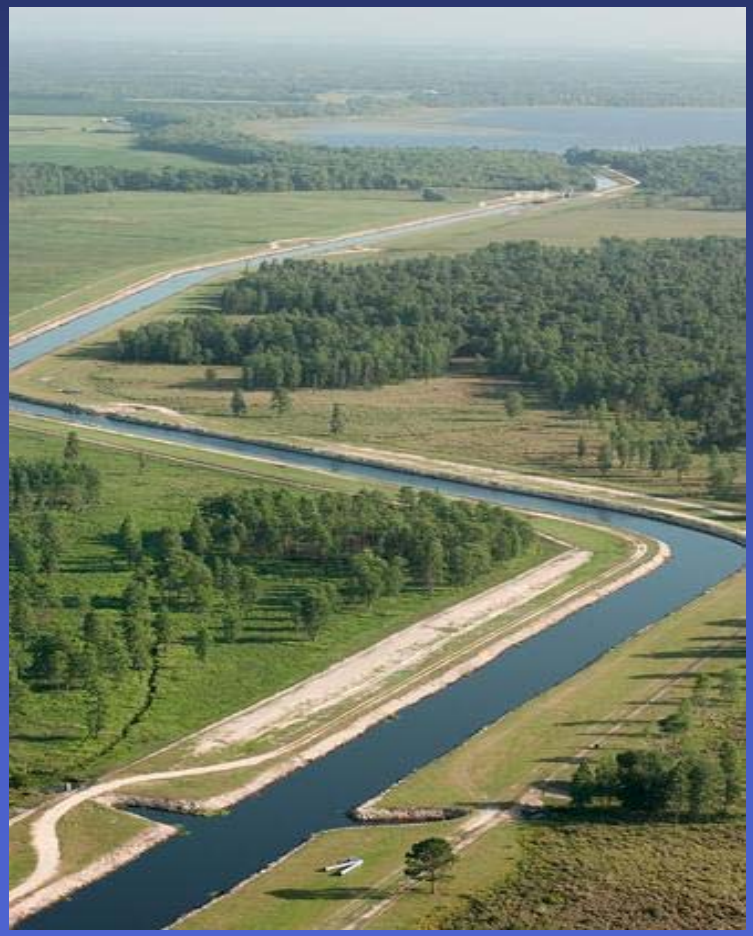
Kissimmee Chain of Lakes

Key Assumptions: Kissimmee Chain of Lakes

- Fish and wildlife to be protected are based on what's there now
- What's there now is a function of historic occurrence of water
- Performance measures used for reservation tied to existing regulation schedule

Key Assumptions: Kissimmee Chain of Lakes (cont.)

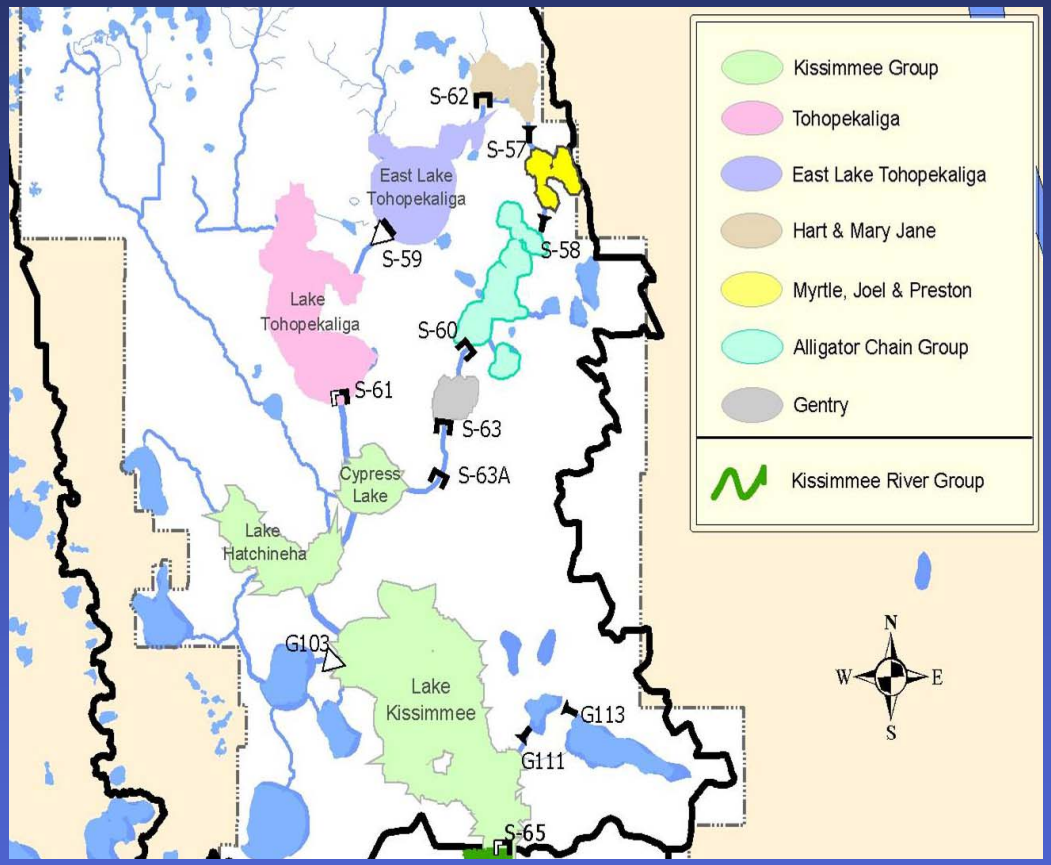
- Revisions to the existing USACOE regulation schedule underway
- 1 to 3 years for USACOE to complete revised regulation schedule
- Outcome of revision uncertain now



Key Assumptions: Chain of Lakes (cont.)

- Governing Board seeks to protect water for fish and wildlife now, does not want to delay reservations until the Corp establishes a new regulation schedule.
- District will revisit reservation when new regulation schedule is implemented and change reservation rule as necessary.

Step 1: Reservation Waterbodies: Kissimmee Upper Basin (KUB)



- Kissimmee Chain of Lakes (KCOL)
- 8 Water Control Structures
- 7 Lake Management Areas (19 Lakes)

Step 2: Fish & Wildlife of the Kissimmee Chain of Lakes

- Fish - 45 species total, 26 species common, includes gamefish
- Wading and other Water Birds - 10 species of wading birds, 3 important rookeries, waterfowl
- Threatened and Endangered Species – snail kites, wood storks, sandhill cranes, bald eagles
- Amphibians and Reptiles -14 species of amphibians, 19 species of reptiles including the American Alligator
- Mammals – 4 species river otter, marsh rabbit, marsh rice rat, and round-tailed muskrat

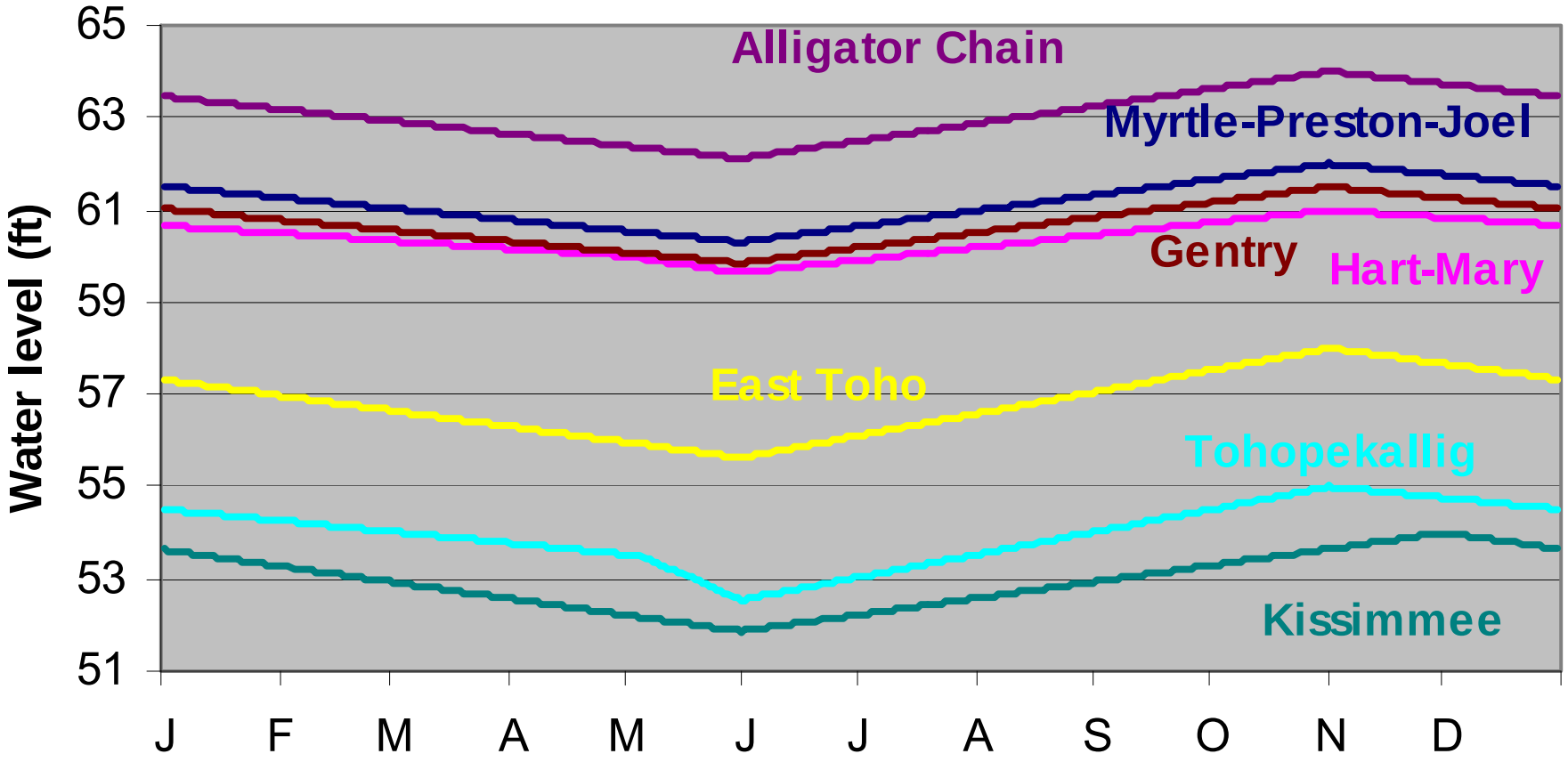
Distribution of Major Fish and Wildlife Resources Among Lakes

	Fish	Rookery	Snail Kites	Sandhill Cranes	Alligator
Kissimmee	X	X	X	X	X
Toho	X		X	X	X
East Toho	X		X	X	X
Hart & MJ	X	X		X	X
Alligator Chain	X				X
Gentry	X				0
Myrtle	0				0

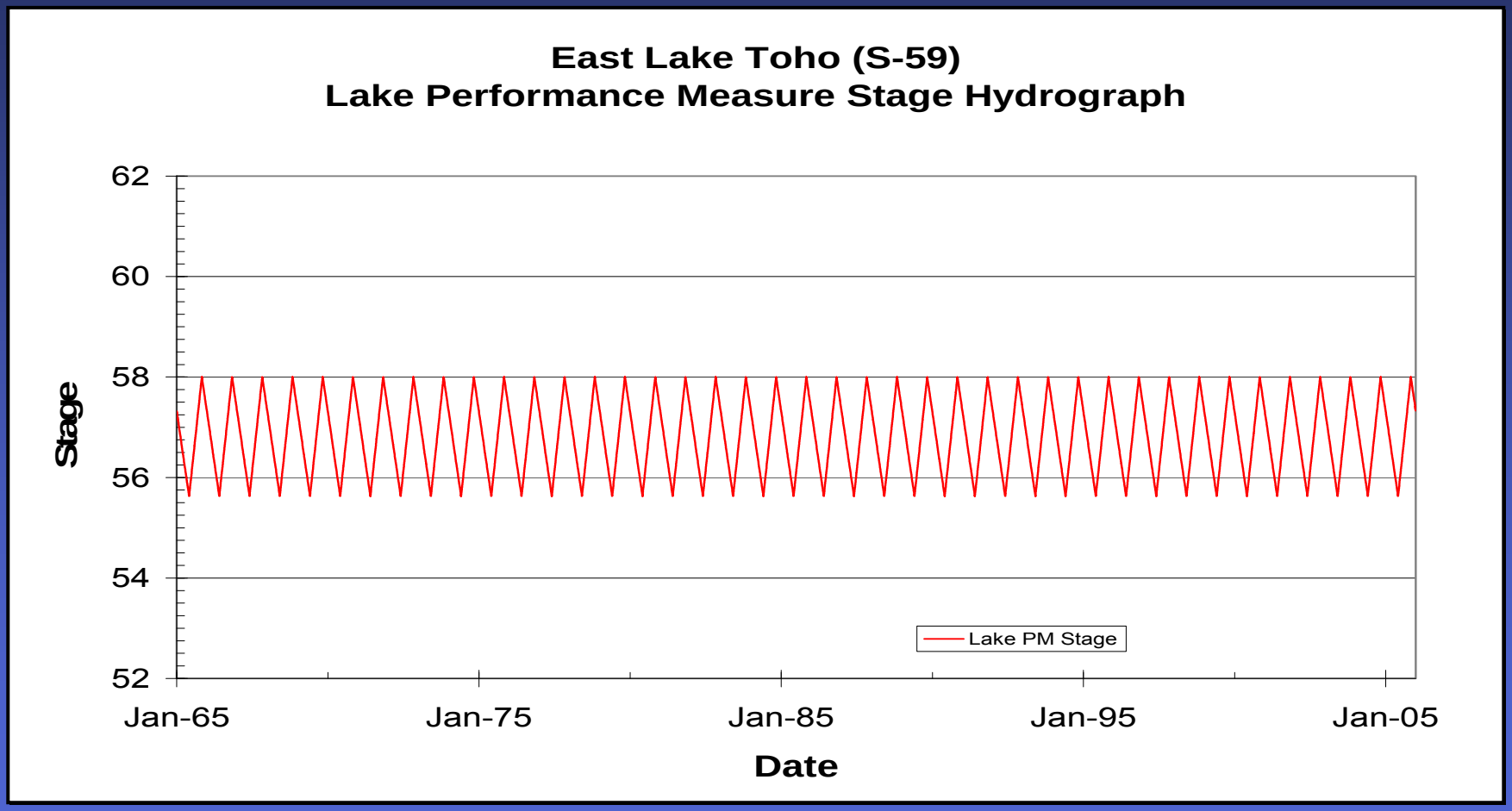
Linkages Between Hydrology and Biology

- One performance measure for each reservation water body
- The performance measure is represented as an annual hydrograph
- Hydrograph represents the threshold for lake water levels below which is needed to protect fish & wildlife and above which is in excess of the water needed to protect fish & wildlife

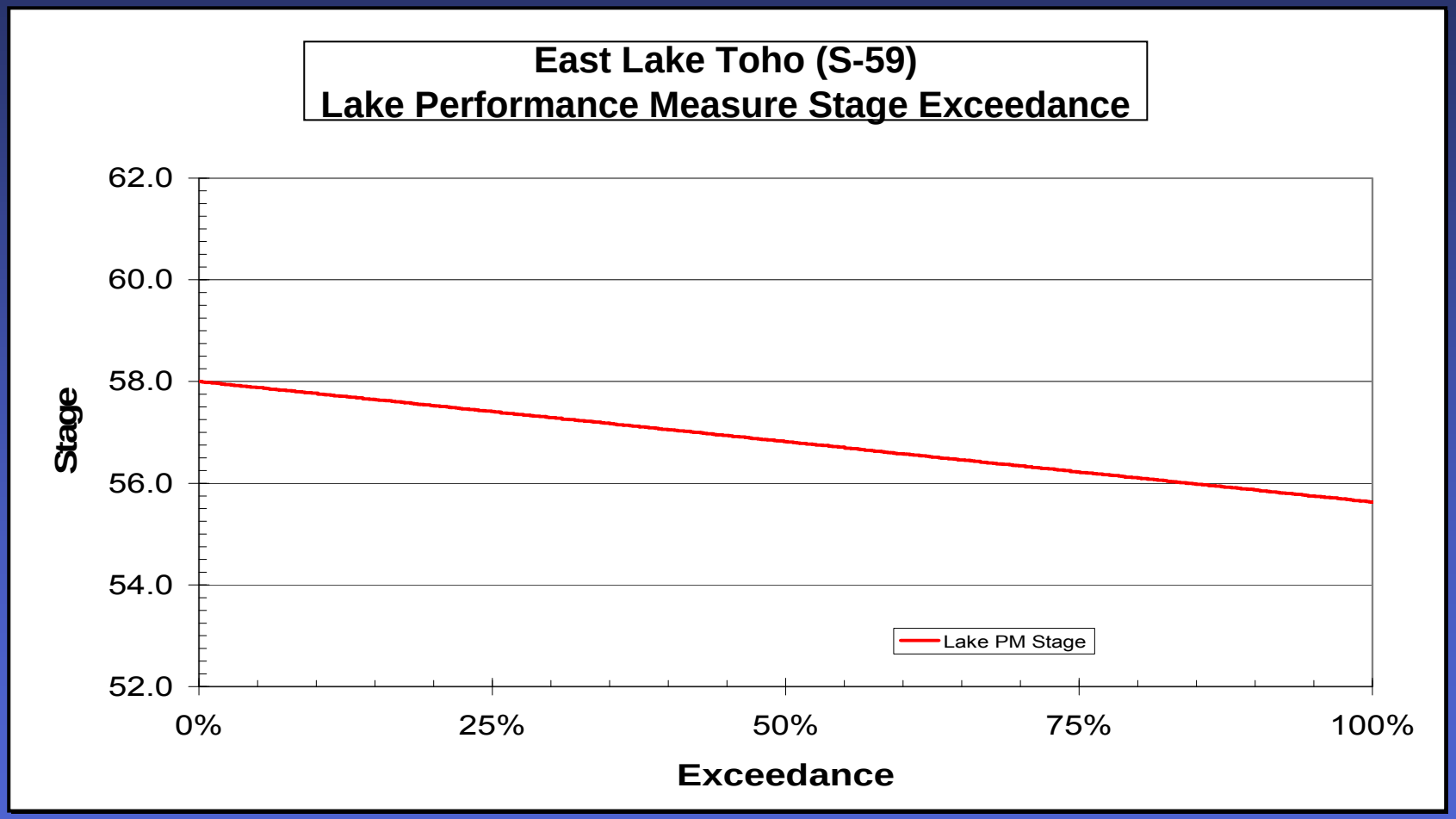
7 Performance Measure Hydrographs



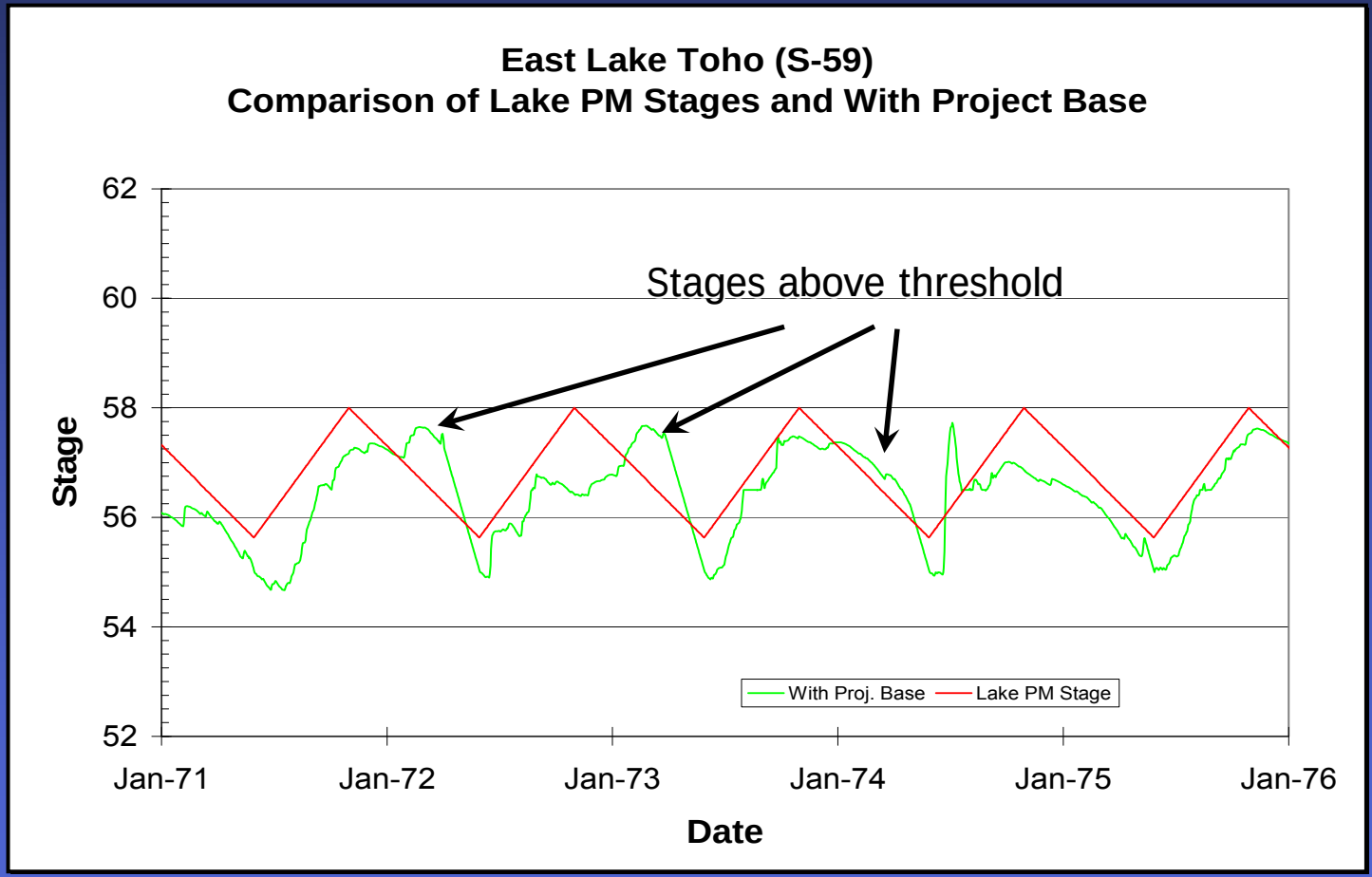
Lake Performance Measures Threshold Stage Hydrograph



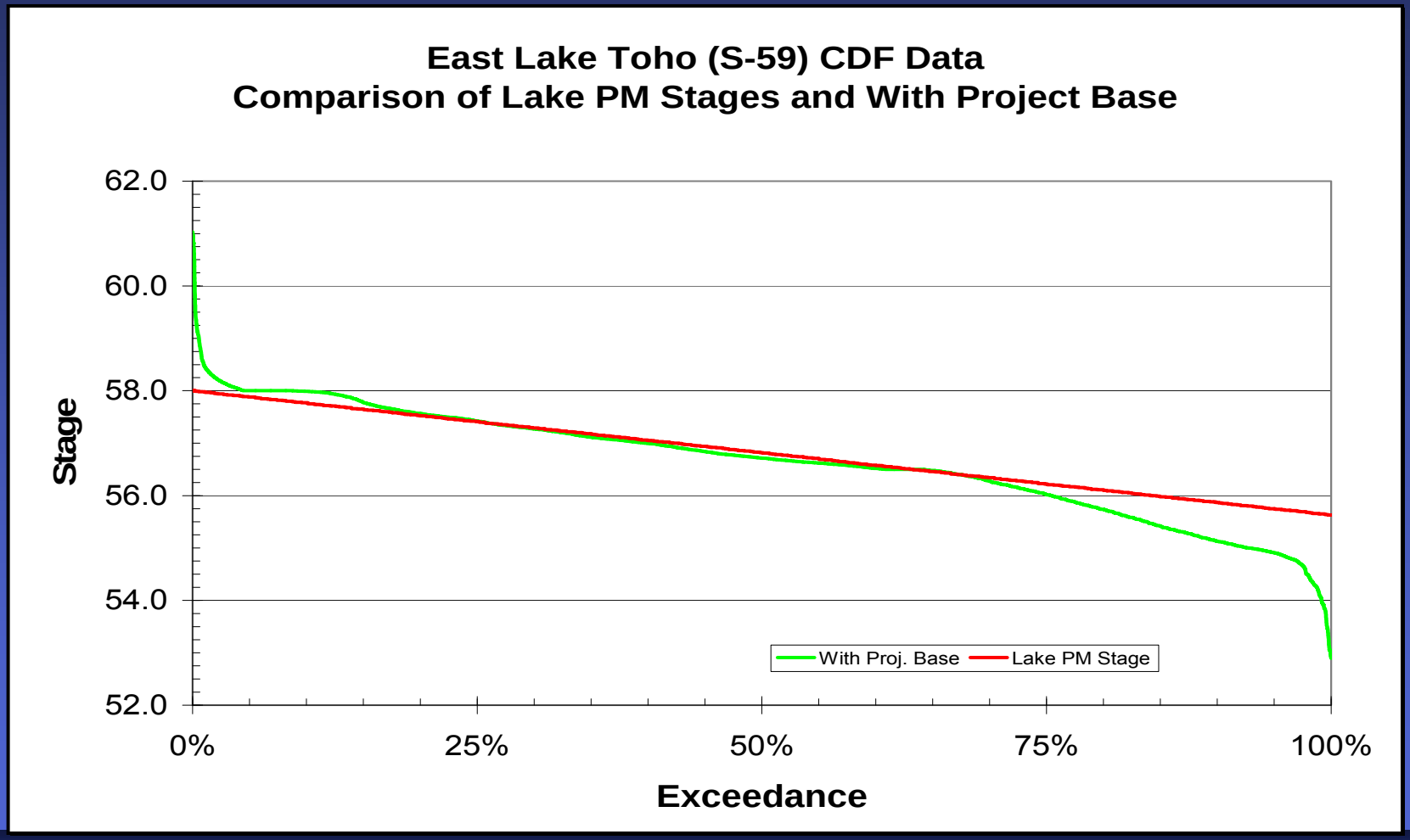
Lake Performance Measures Threshold Stage Probability



Lake Performance Measures Threshold Stage Hydrographs



Comparison of With Project Base with Target Stage Data



Conclusions: Lakes

- The Lake Performance Measure Stage represents a threshold under which water is required for the protection of fish & wildlife
- Comparison of stages from the “With Project Base” condition identify periods of potential surplus water under very wet conditions
  - Exceptions: Kissimmee Cypress Hatchineha and Myrtle Preston Joel
- Ongoing efforts will further evaluate the water necessary for the protection of fish and wildlife within the seven lake reservation water bodies

What's Next

- Complete ongoing evaluations to define reservations
  - Re-evaluate Kissimmee, Hatchineha, Cypress lake performance measures and re-evaluate water for protection of F&W for the water body
  - Complete generation of lower bounds of range of acceptability evaluation
  - Calculate range of acceptable flows between KCOL that are protective of fish and wildlife

What's Next (cont.)

- Evaluate stakeholder alternatives/comments
- Quantify waters above the line defining waters needed for protection of fish and wildlife
- Define the recommended water reservations
  - Discuss results and staff recommendations with stakeholders at March 26th workshop
  - Scientific peer review March 31st
  - Seek Governing Board direction on recommended reservations at the April 8th meeting
- Rule drafting

Challenges

- Integrated evaluation of fish and wildlife needs for both Chain of Lakes and restored River is new
  - Existing regulation schedules don't balance water needs for fish and wildlife north and south of S-65
  - As a result, preliminary analysis indicates:
    - Deficiencies in the volume and timing of water needed for protection of fish and wildlife in the restored River
    - Existing regulation and structural constraints produce some surplus water conditions in some of the KCOL during extreme wet conditions

Challenges (cont.)

- How to reserve water needed for the protection of fish and wildlife when there is a range of possible solutions?
  - What factors result in a range of possible solutions:
    - Model accuracy
    - Robustness of biologic response to variation of water
  - Goal is to define a set of bounds within which decision makers are equally sure/unsure that the desired response will occur
    - Describe how today, results at next workshop

Challenges (cont.)

- The USACOE's revised regulation schedule will evaluate operational fixes to more effectively distribute water
- Opportunity exists to evaluate structural constraints of system for flood protection and environmental enhancement in future
- Policy question: How to protect water for fish and wildlife today knowing there may be future opportunities to redirect surpluses to meet deficits downstream

Questions

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