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Southeast Arkansas Feasibility Study

Hydrologic and Hydraulic Analyses

August 4, 2005



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Scope of Work

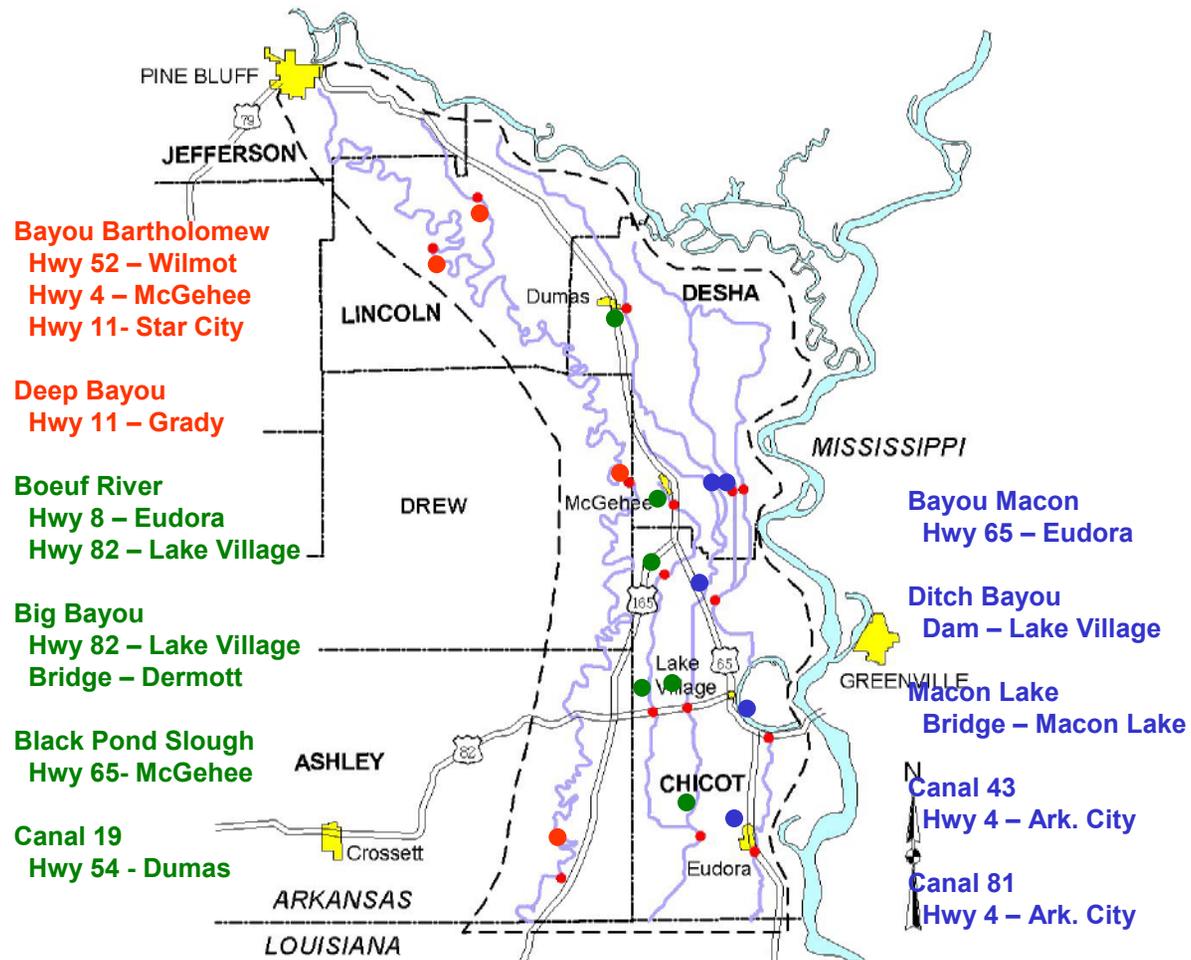
- 1. Hydrology/Hydraulics for existing conditions and 3 flood control alternatives**
 - a. HEC-HMS (Develops flows)**
 - b. HEC-RAS (Develops water- surface profiles)**
 - c. FEAT (Develops flooded acres)**

- 2. Water supply analysis**
 - a. Water demand for study area**
 - b. Water available from Arkansas River**



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Southeast Arkansas Study Area





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Existing Conditions HEC-HMS Modeling

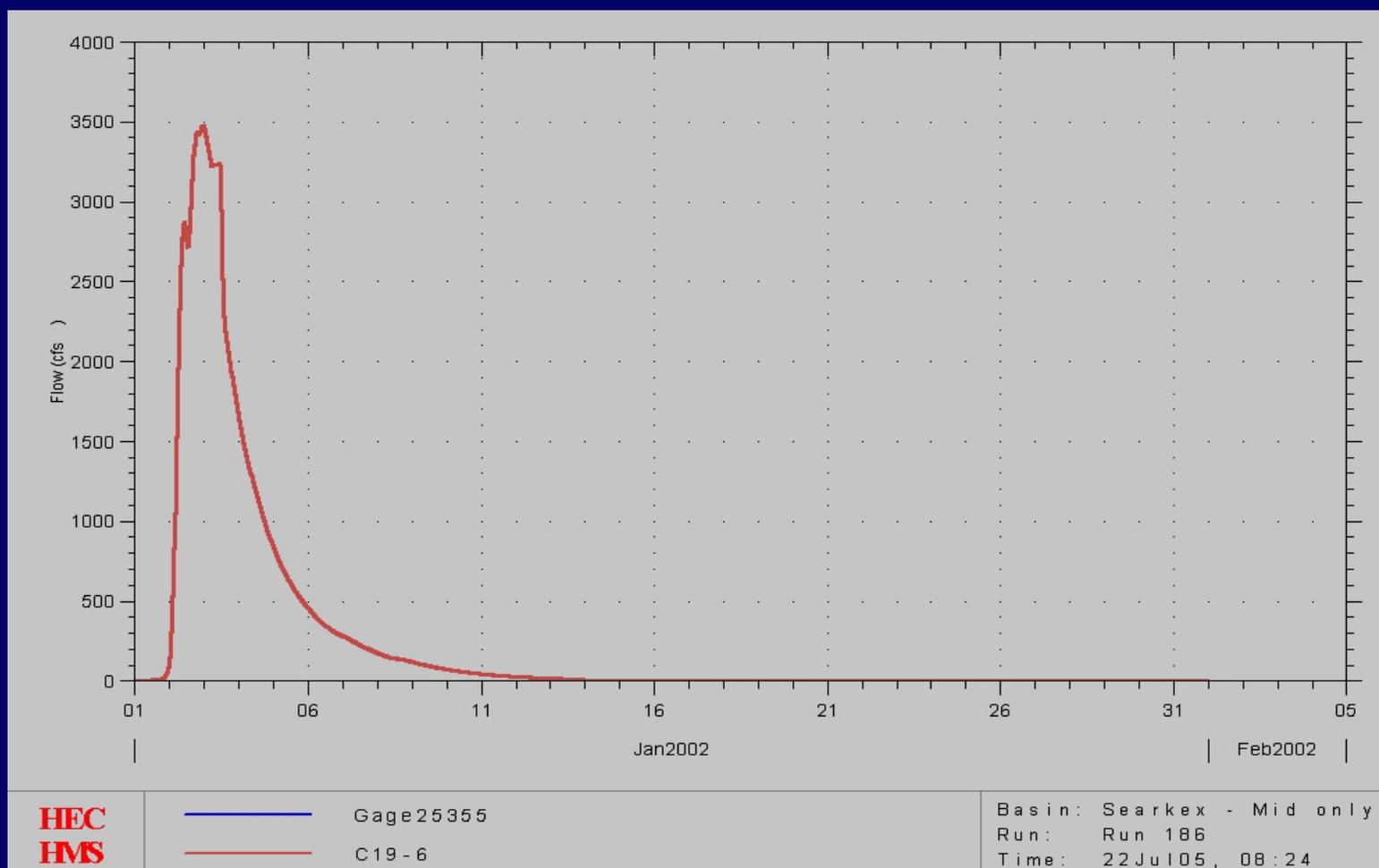
- 1. Determine basin characteristics.**
- 2. Obtain frequency rainfall data from TP40.**
- 3. Calibrate to measured flows at gage locations.**
- 4. Input frequency rainfall and make runs.**



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Canal 19 – Exis Conds

2-yr Flow Hydrograph





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Existing Conditions HEC-RAS Modeling

- 1. Obtain channel geometry.**
- 2. Field observation to determine channel and overbank roughness.**
- 3. Calibrate to known events.**
- 4. Input HEC-HMS discharges and make runs.**



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Surveyed Cross Sections

<u>Basin Section</u>	<u>Stream</u>	<u>Number of Cross Sections</u>
West	Bayou Bartholomew	144
	Deep Bayou / Jacks Bayou	23
Middle	Boeuf River / Canal 19	93
	Big Bayou / Black Pond Slough	52
	Canal 18	21
East	Bayou Macon / Ditch Bayou	23
	Connerly Bayou / Macon Lake/ Canal 81	56
	Canal 43	36
Total		448

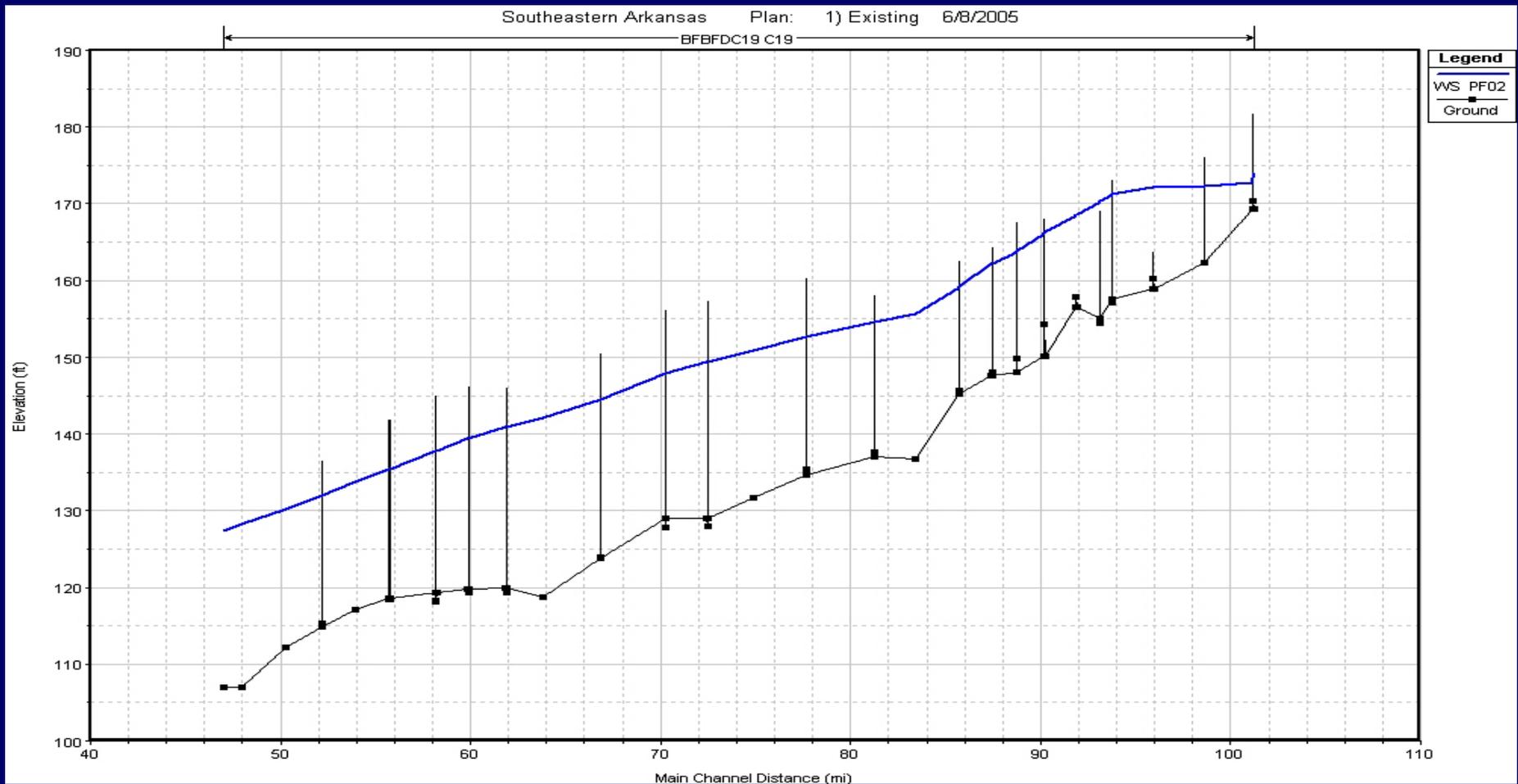


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Canal 19

2-Yr WS Profile

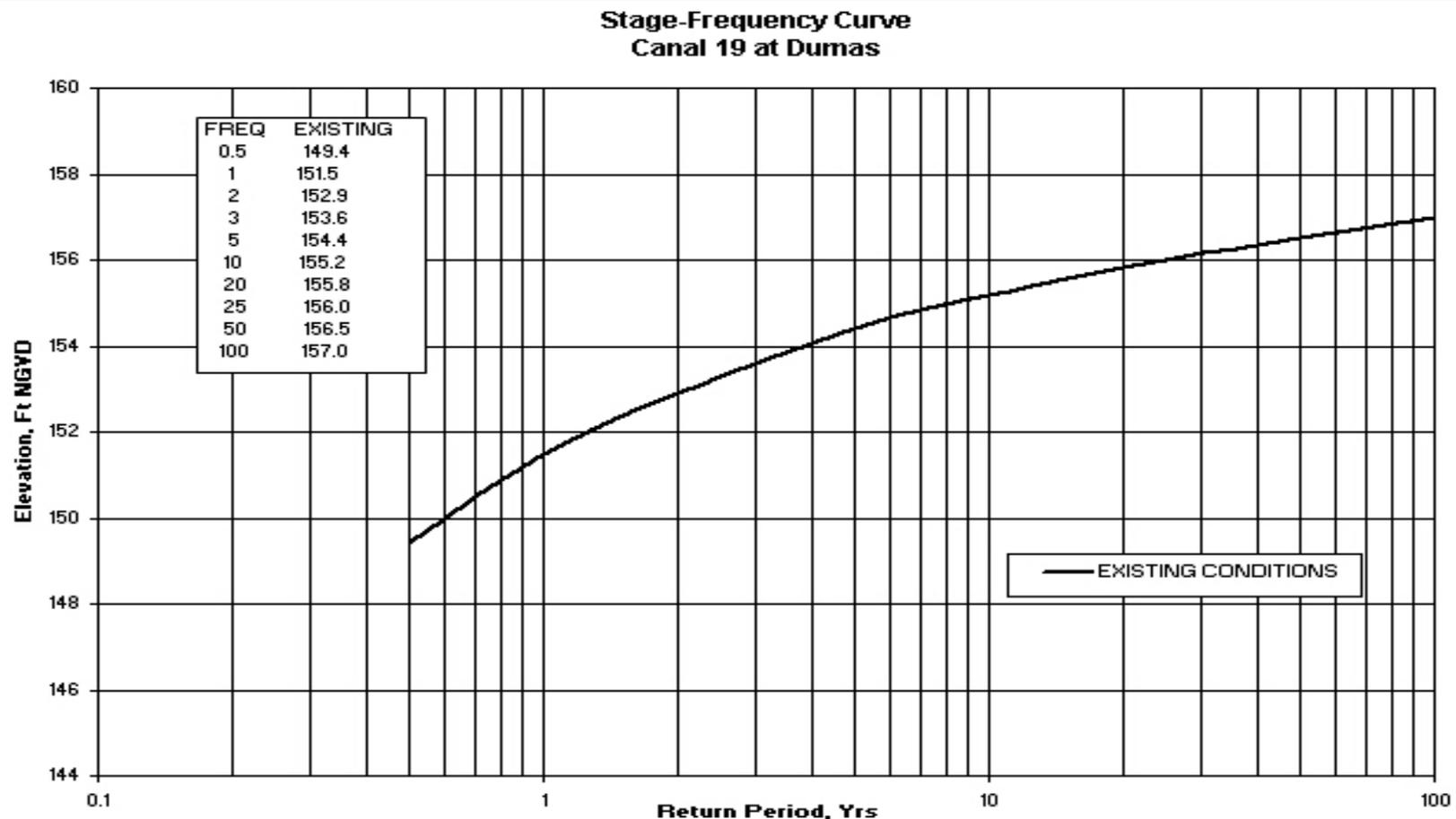
Existing Conds





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Canal 19 Stage-Frequency Existing Conds





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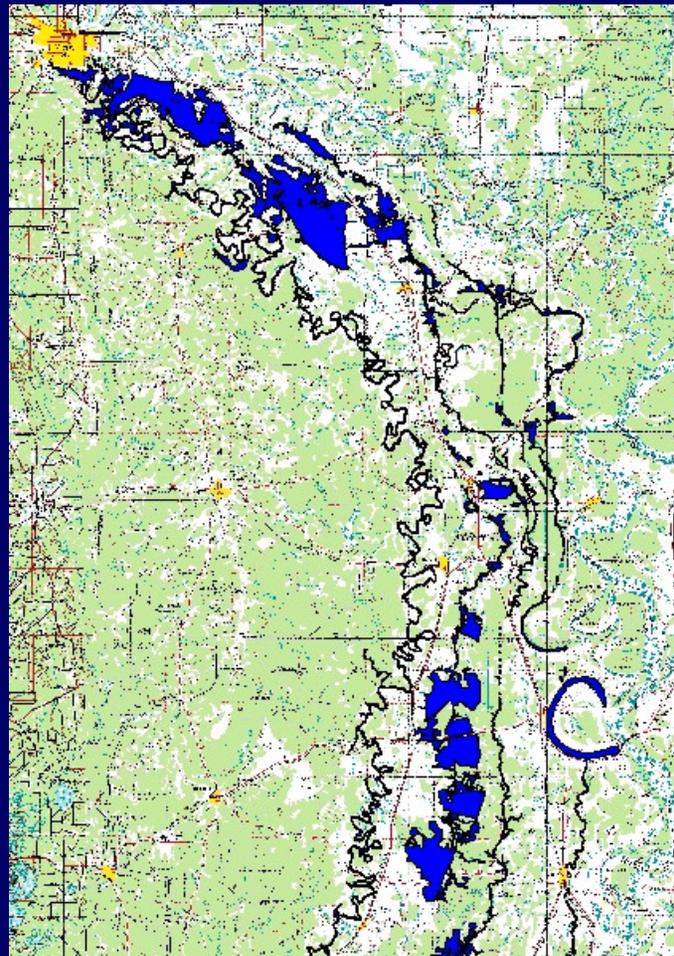
Existing Conditions FEAT Modeling

- 1. Obtain DEM (Digital Elev. Model) data from USGS.**
- 2. Input HEC-RAS water-surface profiles for selected frequencies into model.**
- 3. Calibrate obtained flooded areas to known events using satellite photos.**
- 4. Make production runs.**



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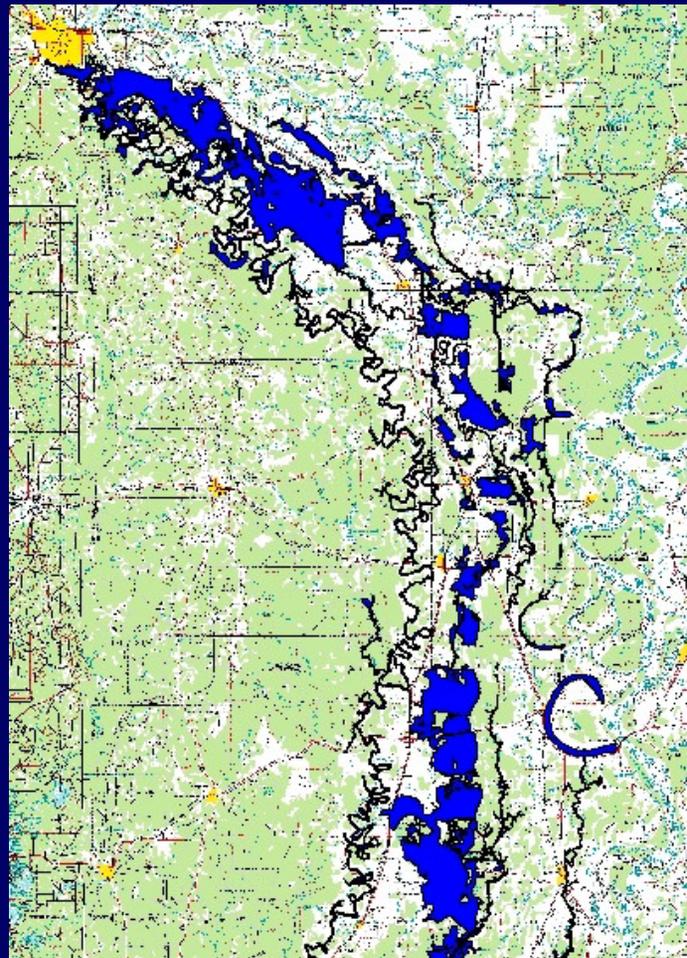
Existing 1-yr Flood





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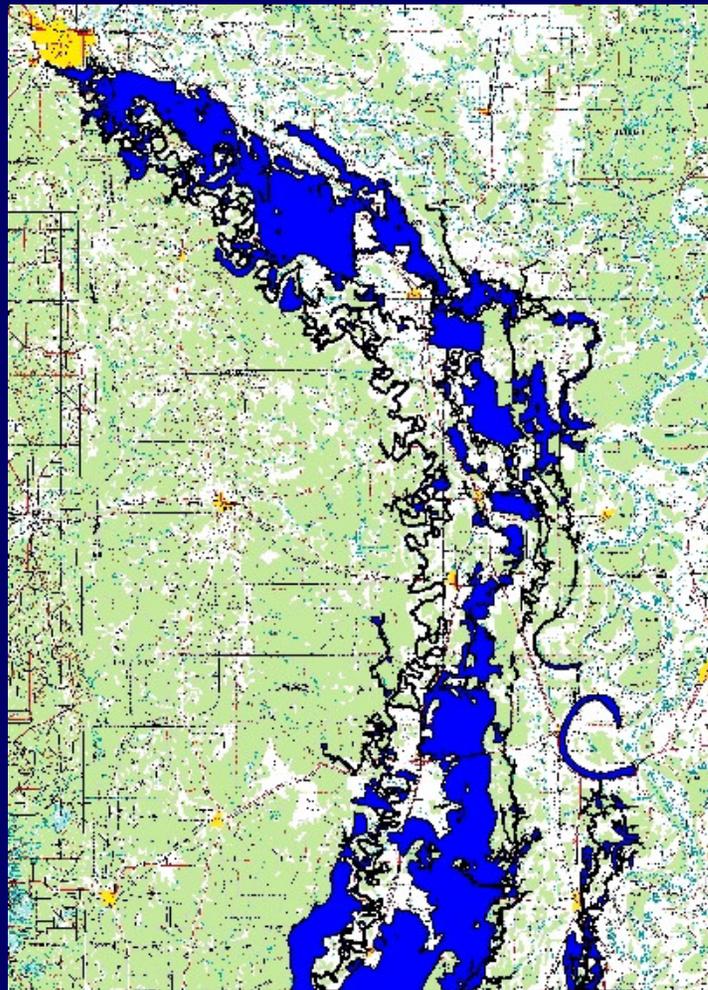
Existing 2-yr Flood





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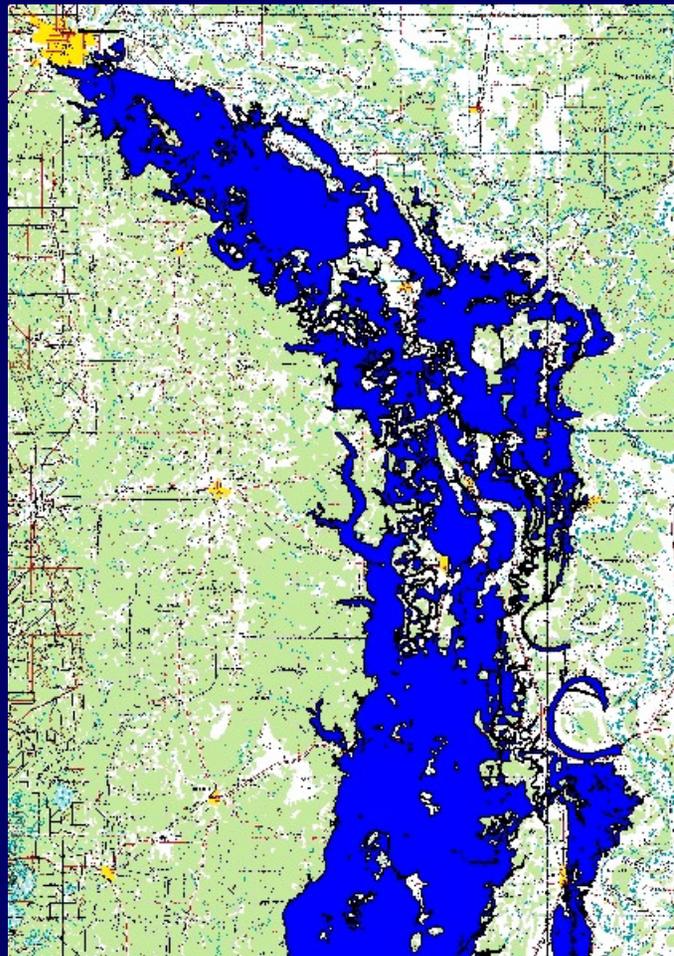
Existing 5-yr Flood





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Existing 100-yr Flood

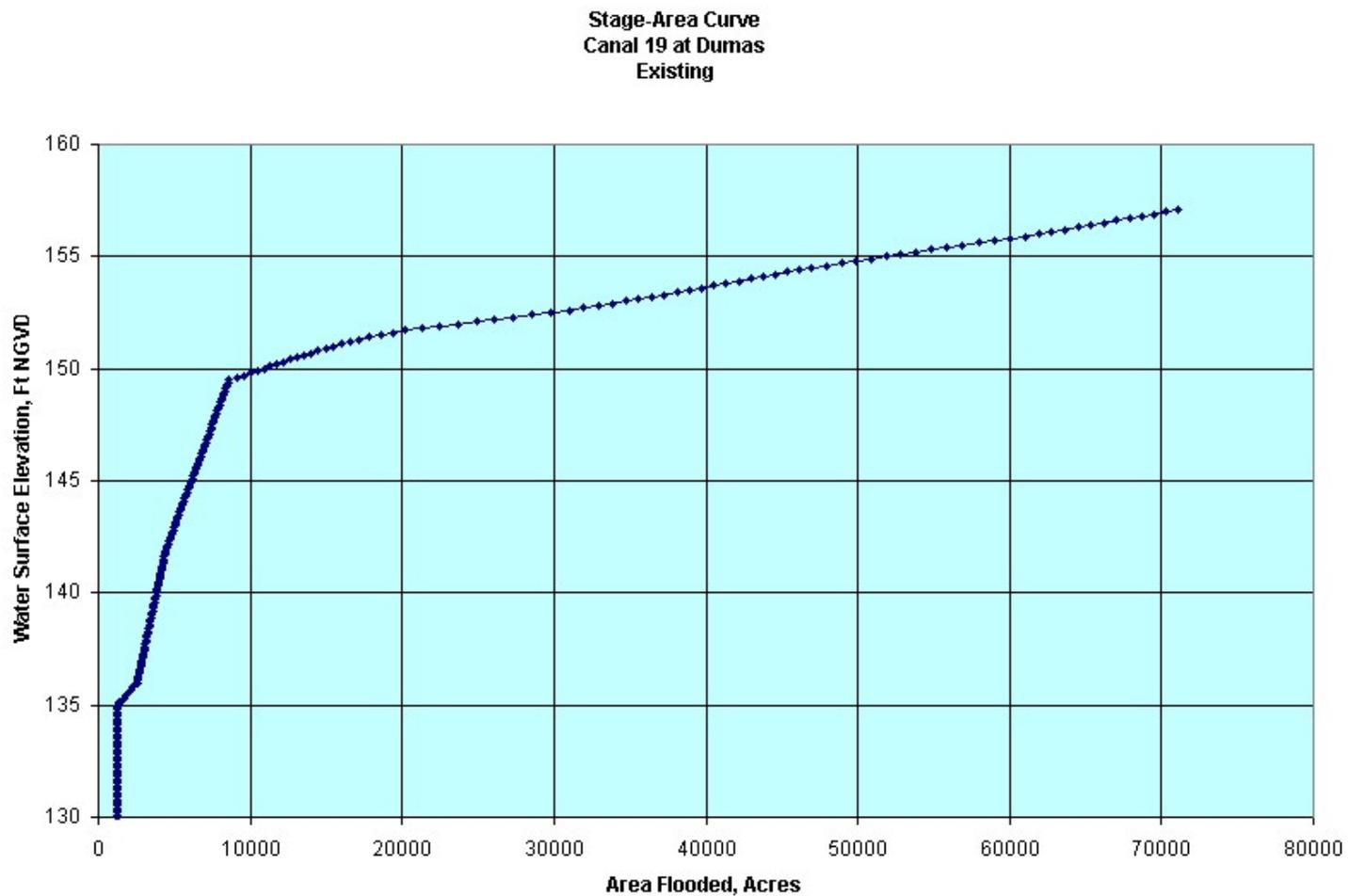




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Canal 19

Stage-Area Curve





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Alternative 1

Proposed work consists of clearing and snagging along Deep Bayou, Boeuf River, Canal 19, Big Bayou, Black Pond Slough, Canal 43, Canal 81, Macon Lake, and Bayou Macon.



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Alternative 1

HEC-HMS Modeling

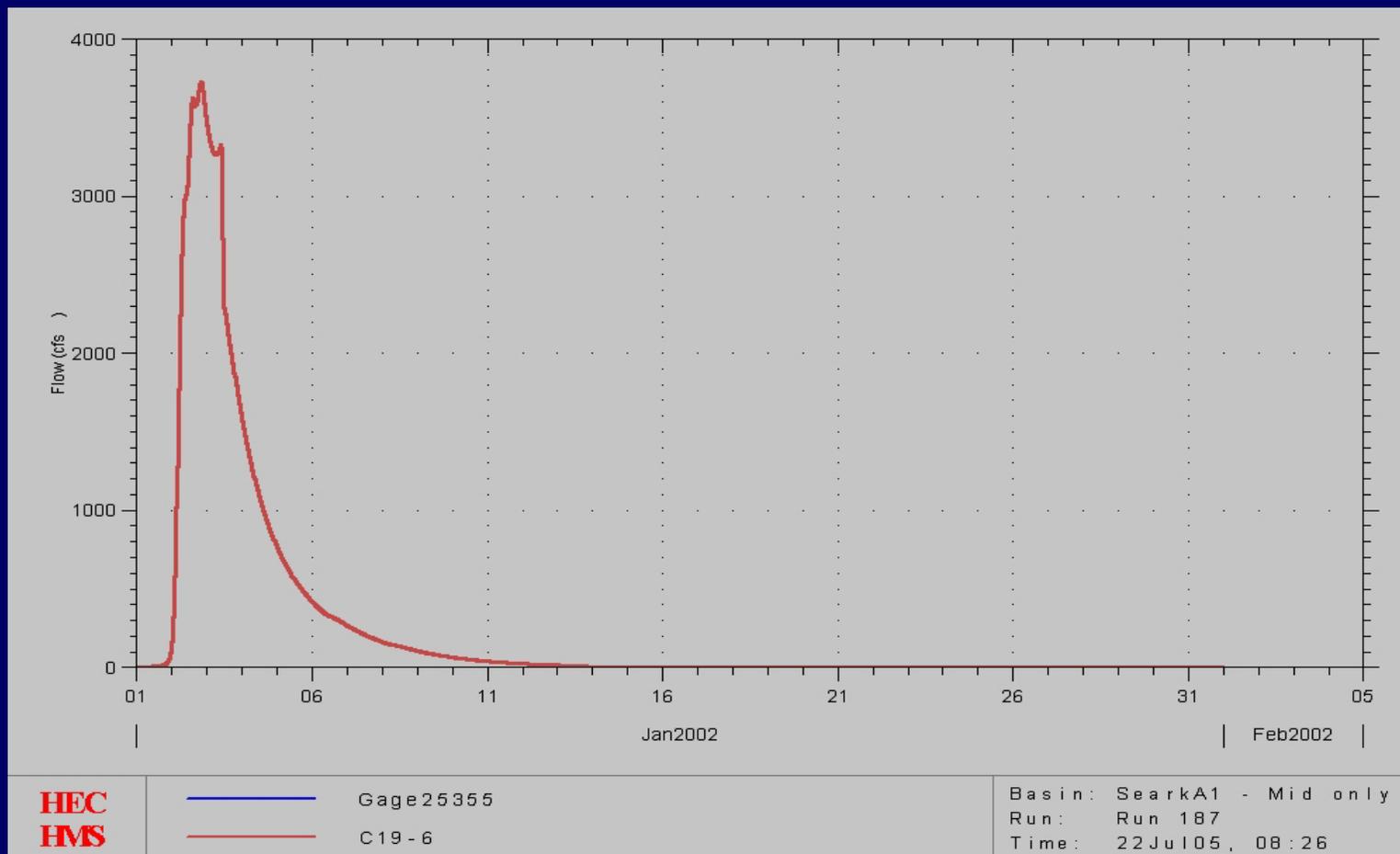
- 1. Change routing parameters (storage – outflow relationship) to reflect Alternative 1 conditions.**
- 2. Make runs.**



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Canal 19 – Alt 1

2-yr Flow Hydrograph





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Alternative 1

HEC-RAS Modeling

- 1. Revise channel n-values to reflect Alternative 1 conditions.**
- 2. Input revised HEC-HMS flows and make runs.**

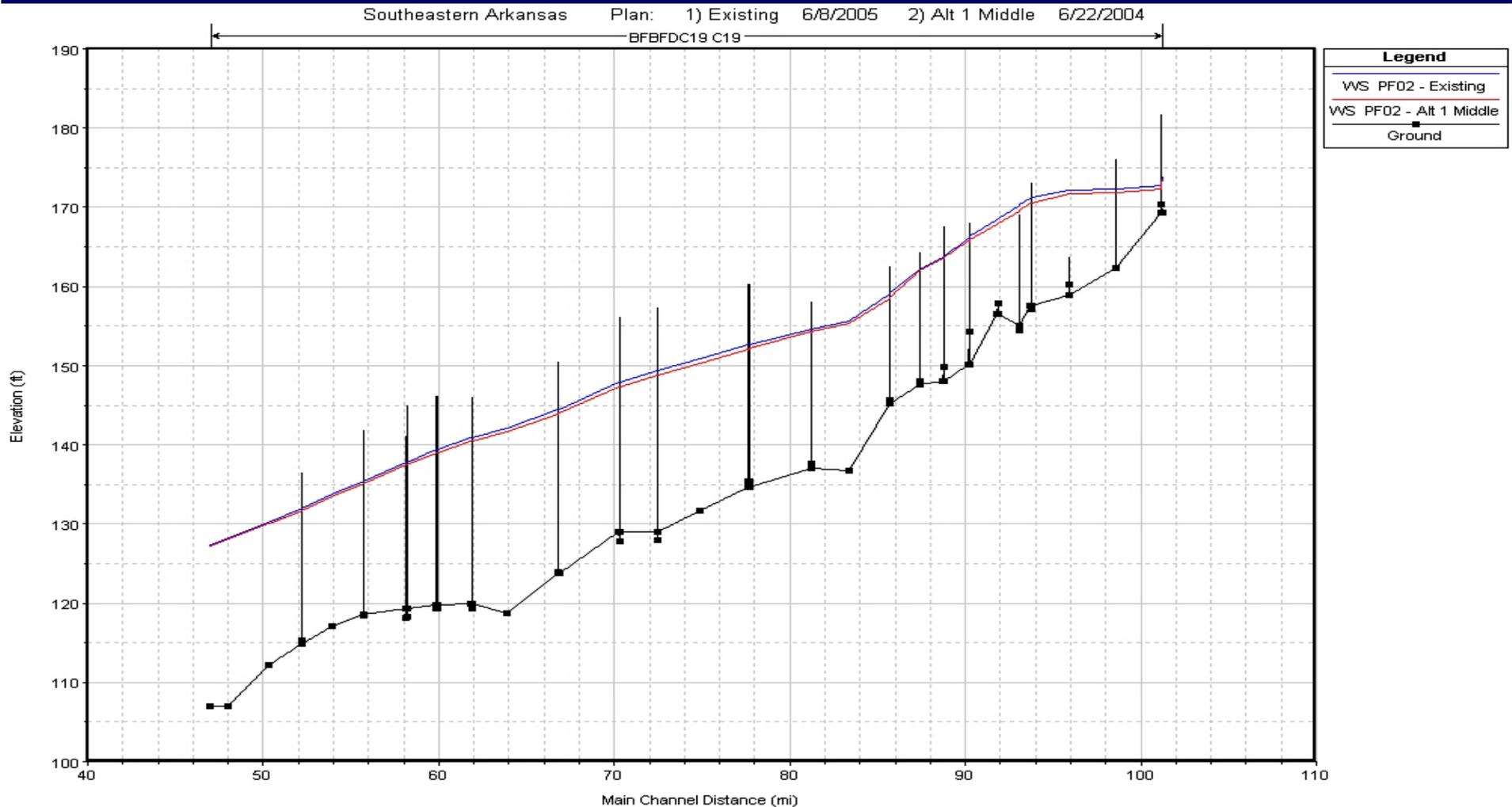


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Canal 19

2-Yr WS Profile

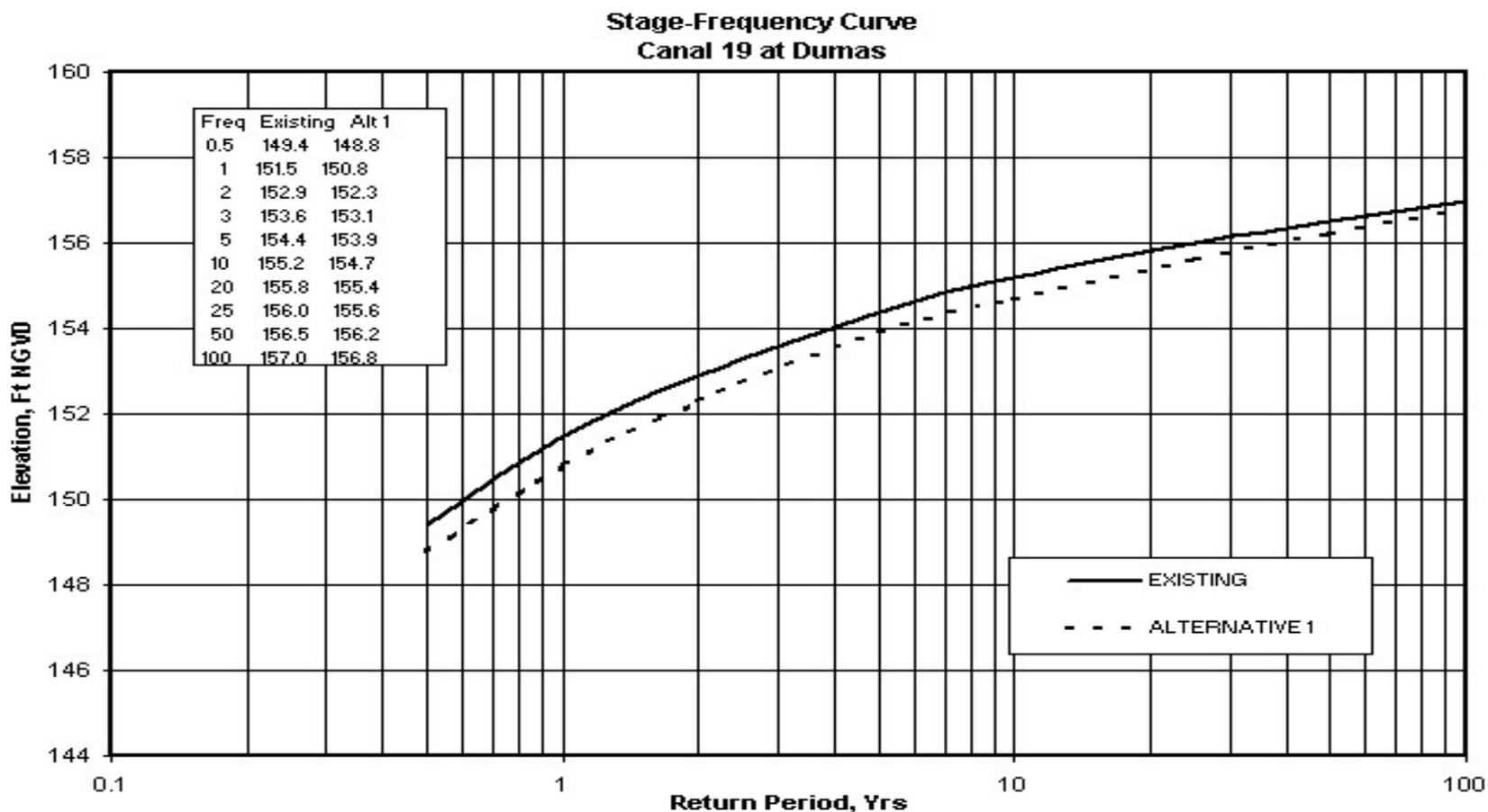
Exis vs Alt 1





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Canal 19 Stage-Frequency Alt 1 vs Existing





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Alternative 1

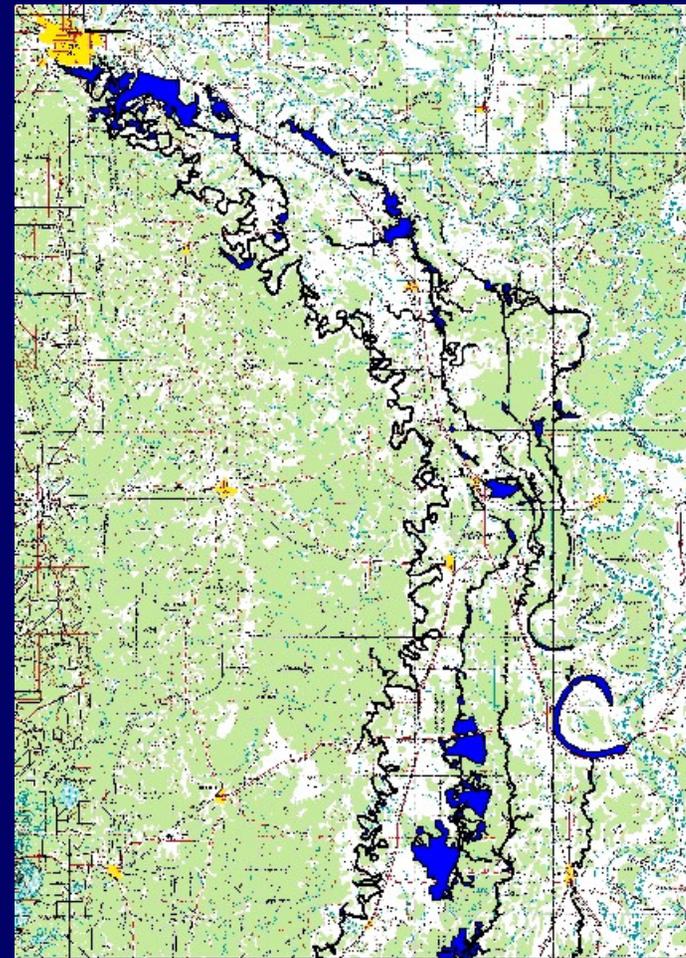
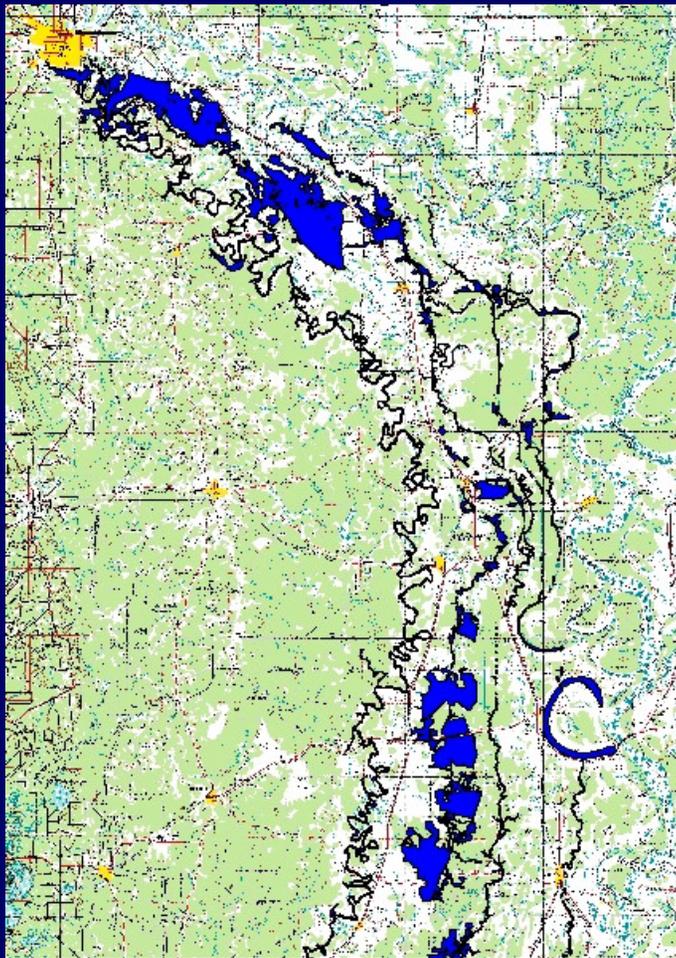
FEAT Modeling

- 1. Input revised HEC-RAS water-surface profiles for selected frequencies into model.**
- 2. Make production runs.**



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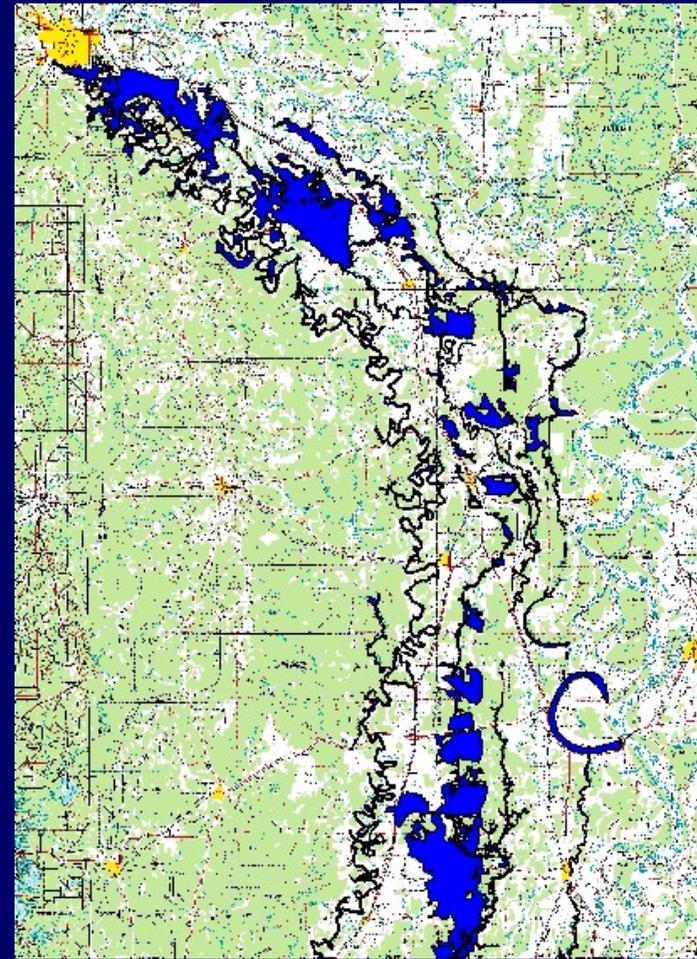
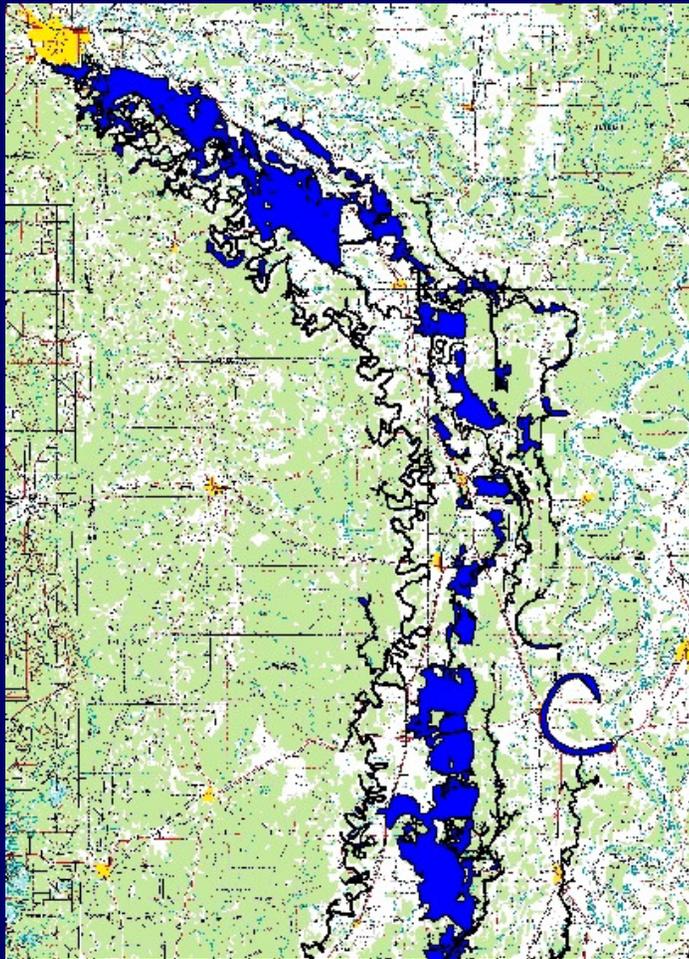
Existing vs Alt 1 1-yr Flood





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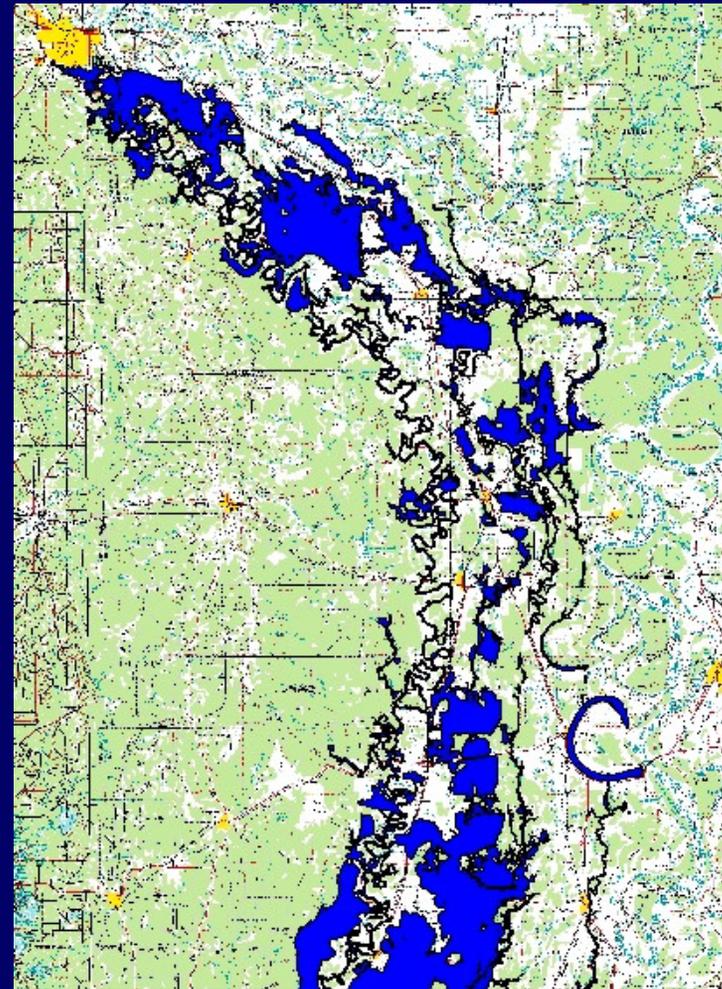
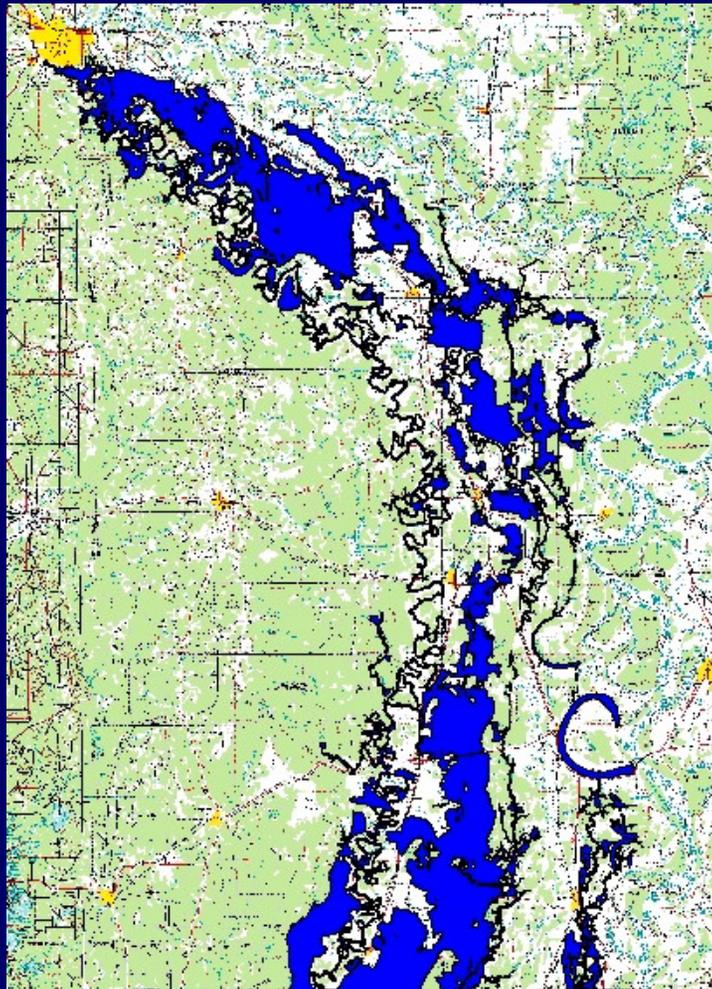
Existing vs Alt 1 2-yr Flood





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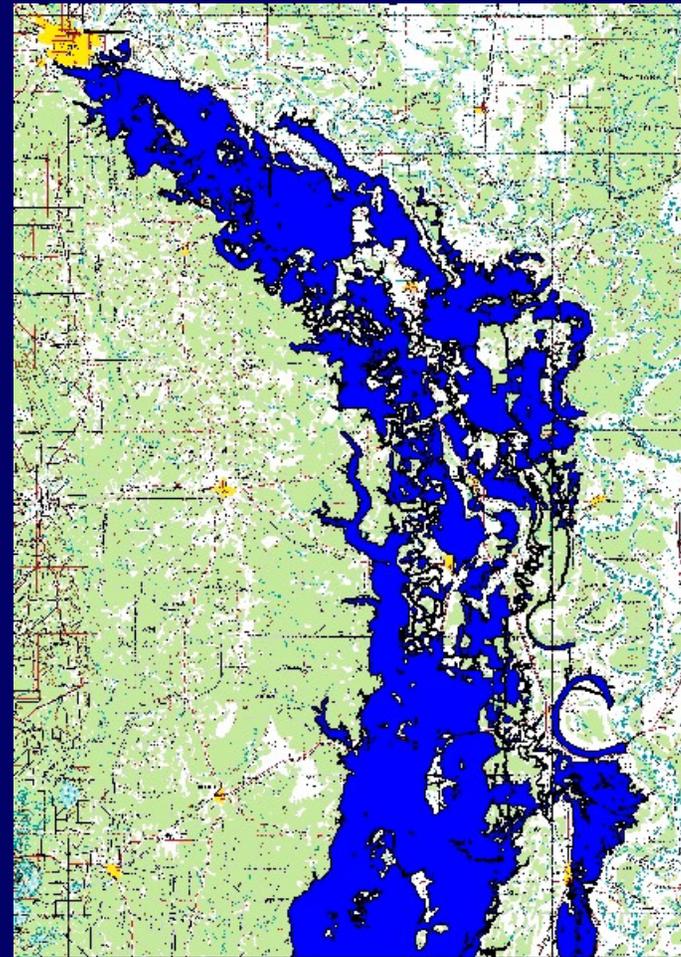
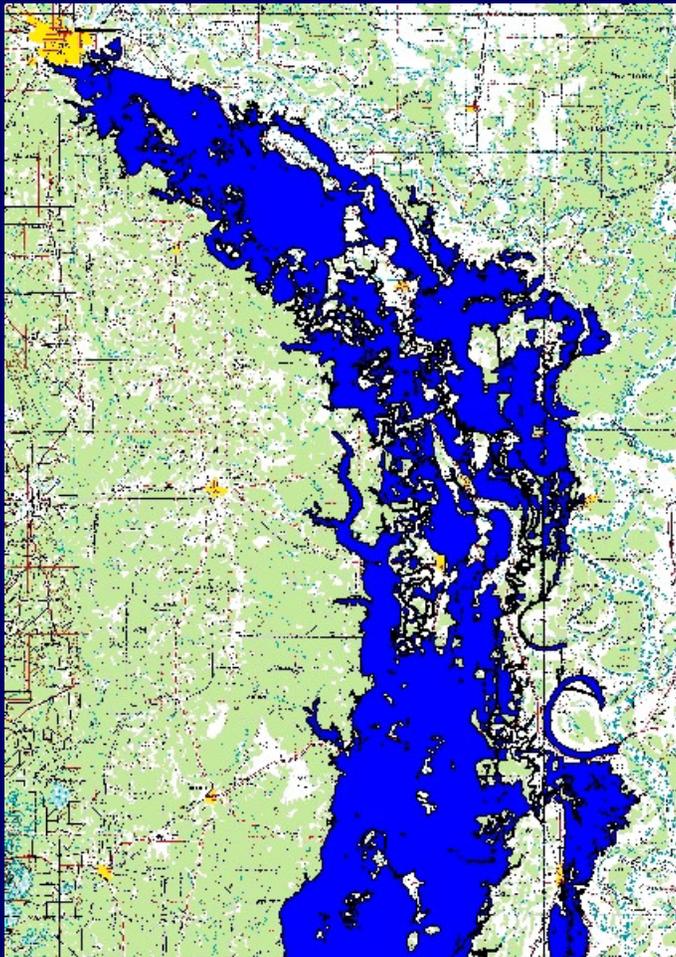
Existing vs Alt 1 5-yr Flood





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Existing vs Alt 1 100-yr Flood





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Alternative 2

Proposed work consists of channel enlargement along Deep Bayou, Boeuf River, Canal 19, Big Bayou, and Black Pond Slough. Also, clearing/snagging will be proposed for Canal 43, Canal 81, Macon Lake, and Bayou Macon.



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Alternative 2

HEC-HMS Modeling

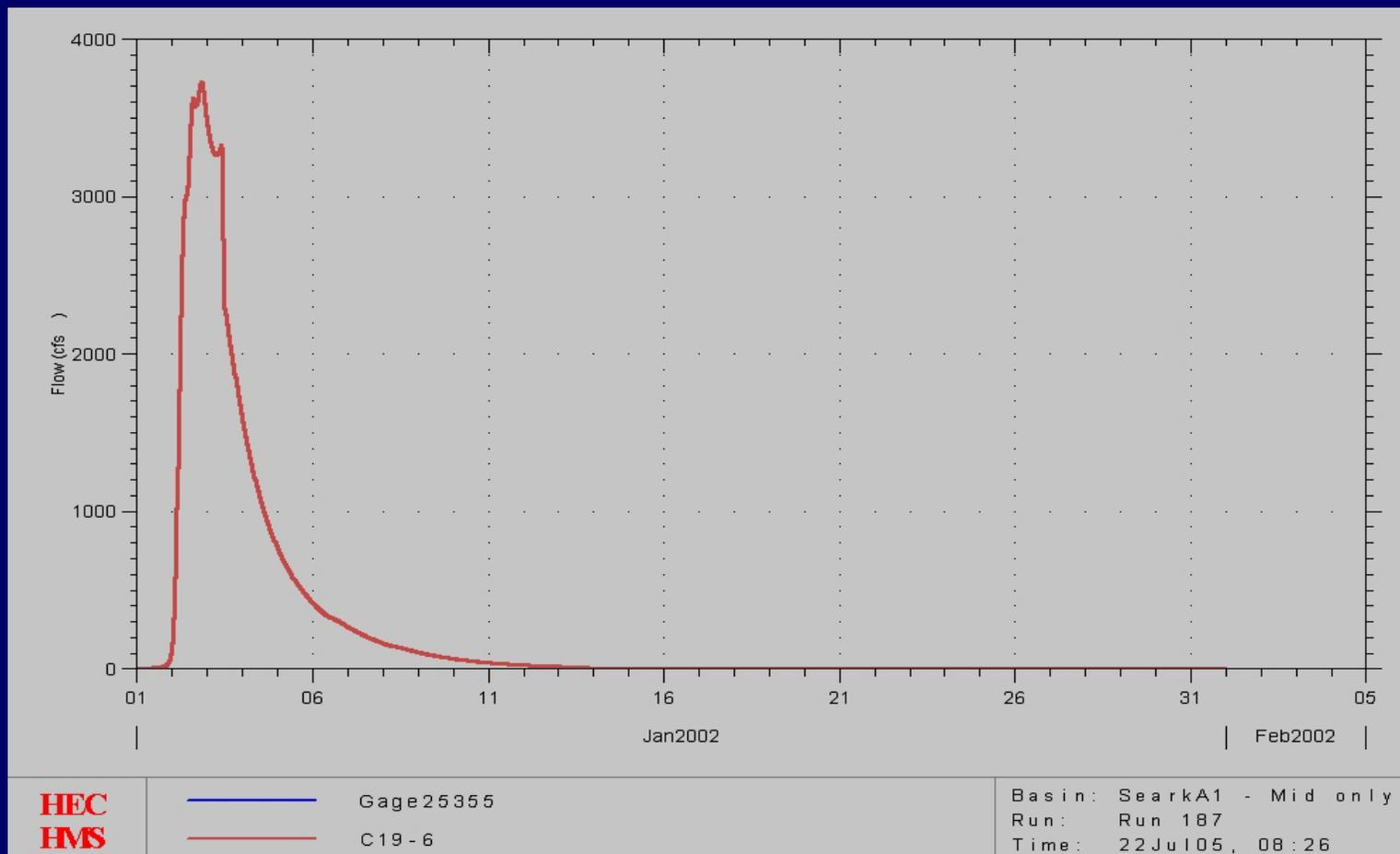
- 1. Change routing parameters (storage – outflow relationship) to reflect Alternative 2 conditions.**
- 2. Make runs.**



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Canal 19 – Alt 2

2-yr Flow Hydrograph





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Alternative 2

HEC-RAS Modeling

- 1. Revise channel geometry, channel n-values, etc., to reflect Alternative 2 conditions.**
- 2. Input revised HEC-HMS flows and make runs.**

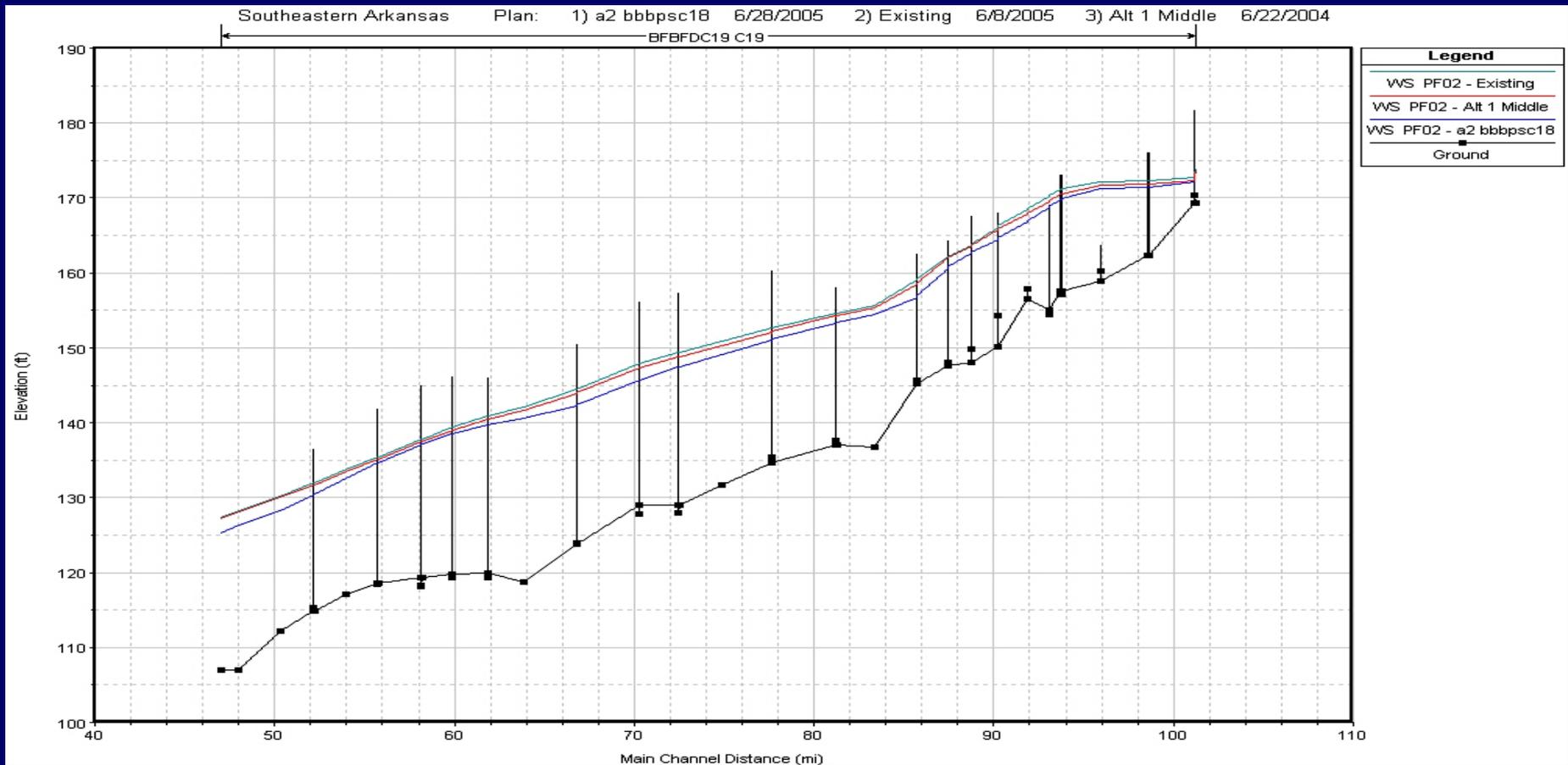


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Canal 19

2-Yr WS Profile

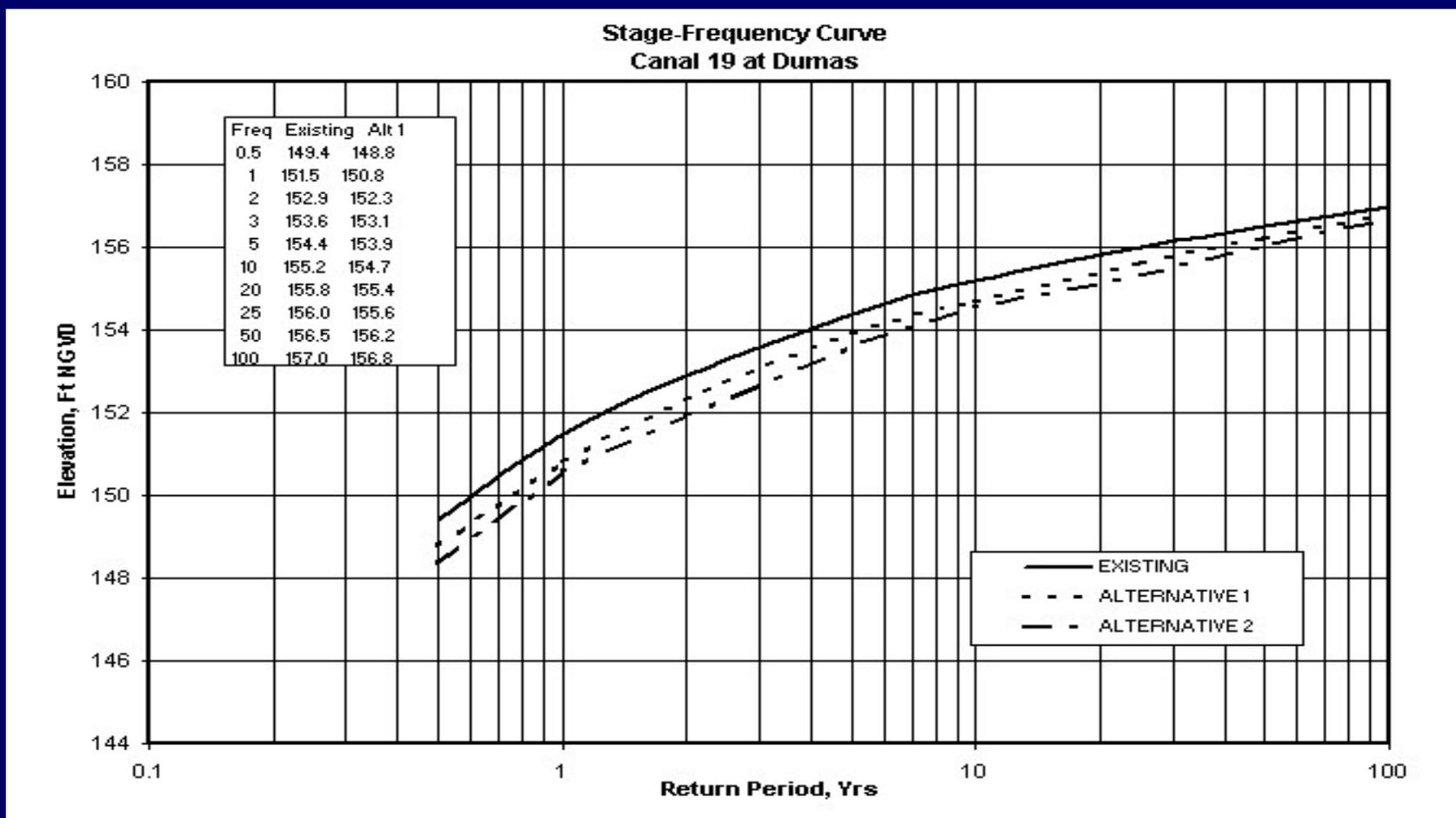
Exis vs Alt 1, Alt 2





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Canal 19 Stage-Frequency Alt 2 vs Existing, Alt 1





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Alternative 2

FEAT Modeling

- 1. Input revised HEC-RAS water-surface profiles for selected frequencies into model.**
- 2. Make production runs.**



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Water Demand

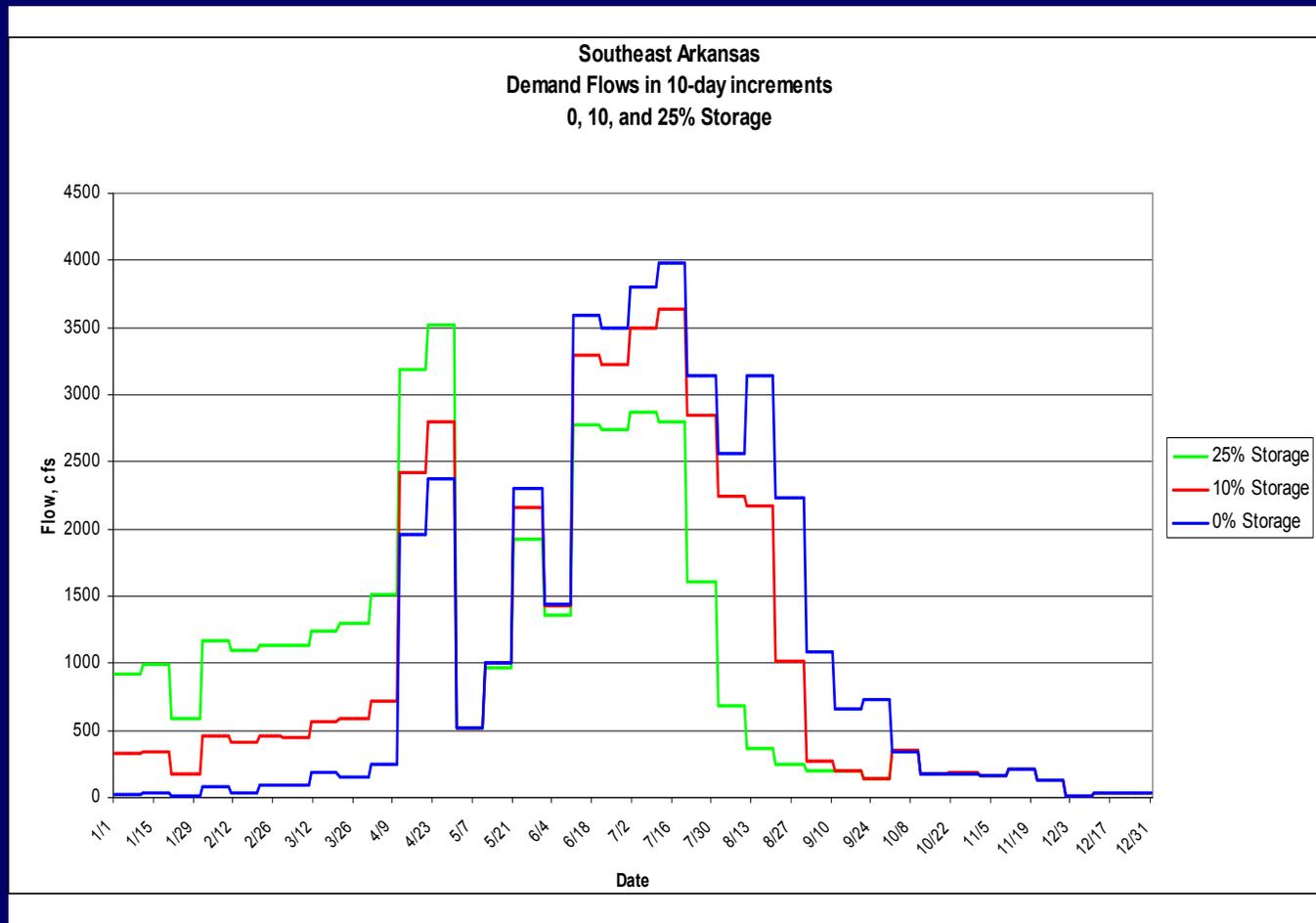
- 1. Demand curves provided by NRCS for entire study area.**

- 2. Three different scenarios analyzed.**
 - a. 0% increase in on-farm storage (existing conditions).**
 - b. 10% increase...**
 - c. 25% increase...**



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Southeast Arkansas Demand Flows





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Water Available

- 1. Arkansas River flow data acquired for P. O. R. 1970 – 2002.**
- 2. Required minimum flows (per Arkansas Soil and Water) removed based on navigational needs and Fish and Wildlife regulations (3000 – 6778 cfs).**



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Water Available (Cont'd)

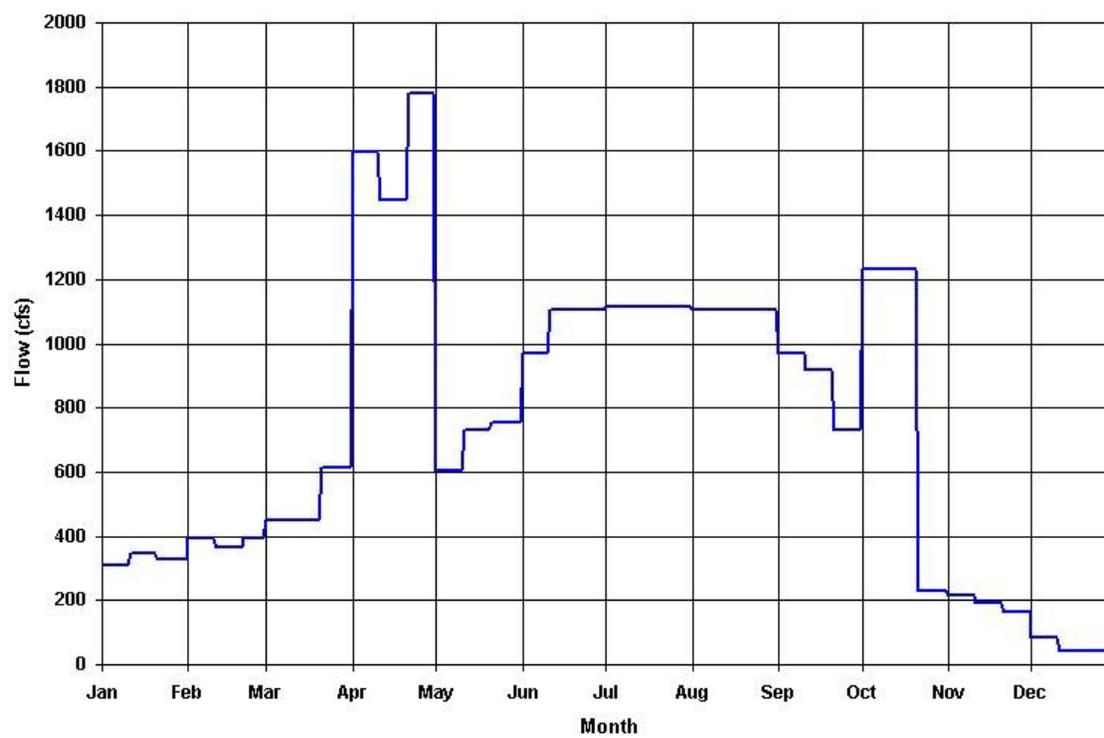
- 3. Flows removed for Bayou Meto project, based on demand curve from Memphis District COE.**
- 4. Remaining flows assumed to be available for use. Statistical analysis shows % of time demand flows are available.**



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Bayou Meto Demand Flows

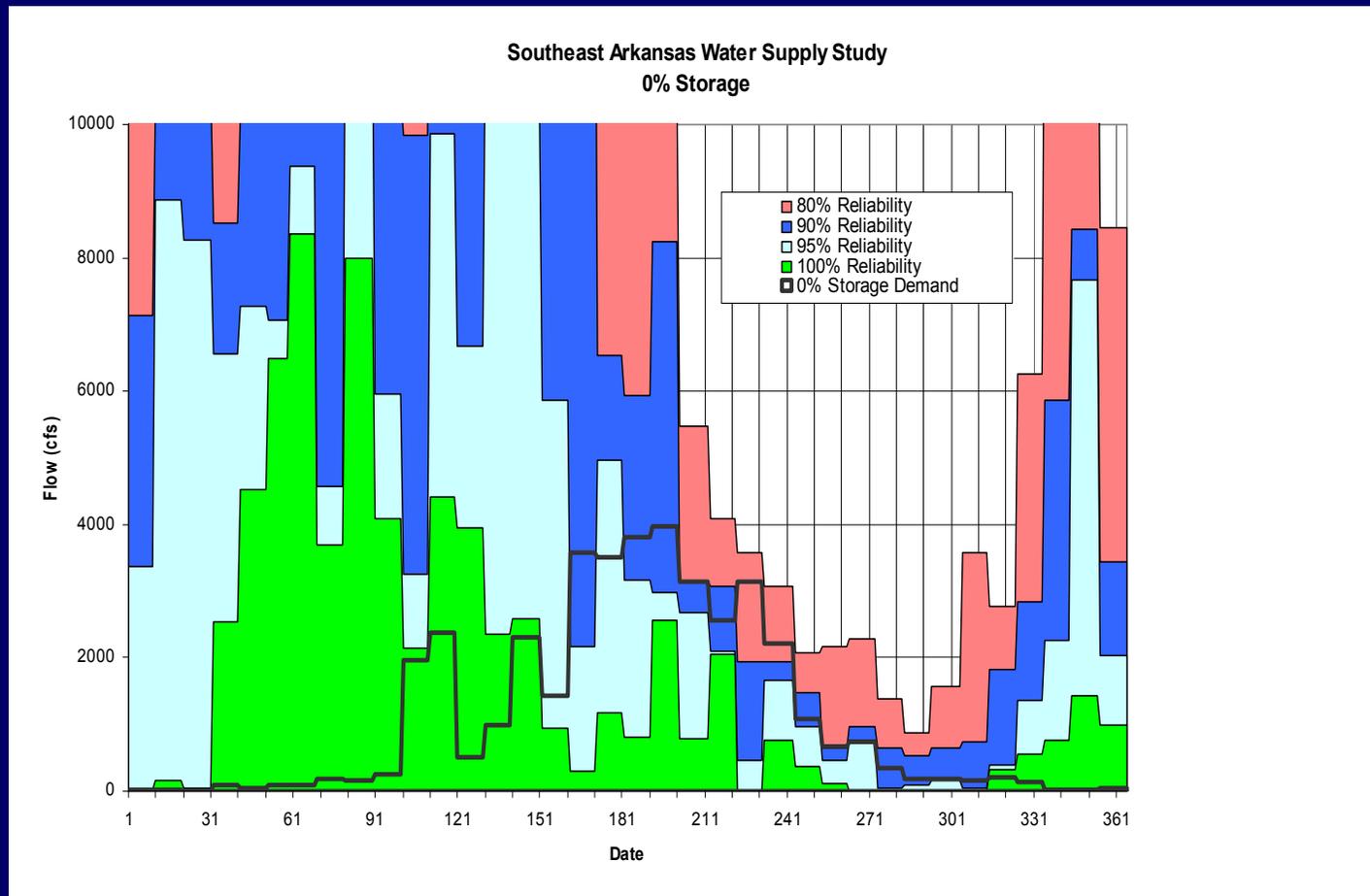
Bayou Meto Irrigation Study - Design Irrigation Demand Flows
Period of Record (1940-1996) - 10 Day Increments





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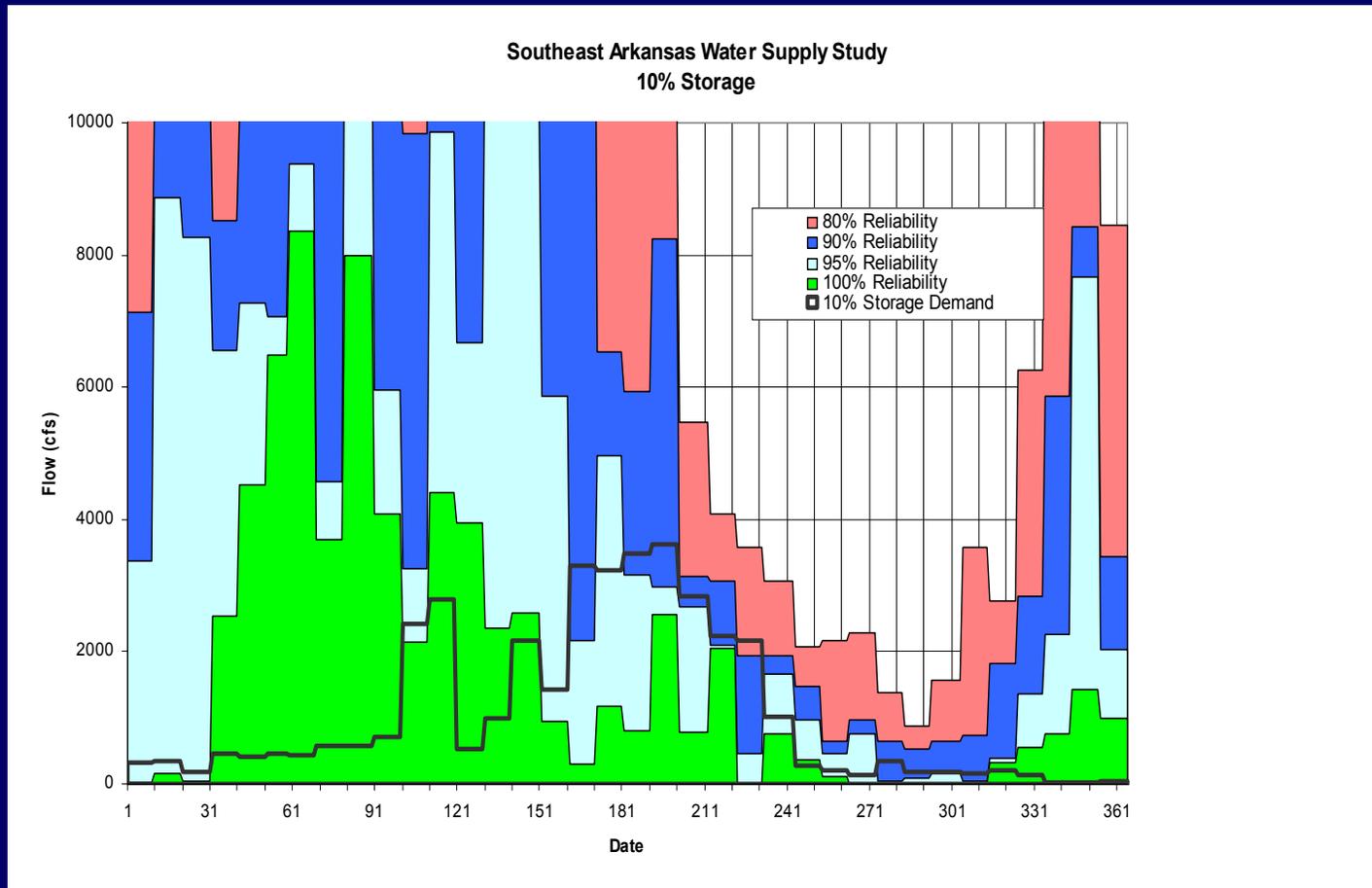
0% Storage





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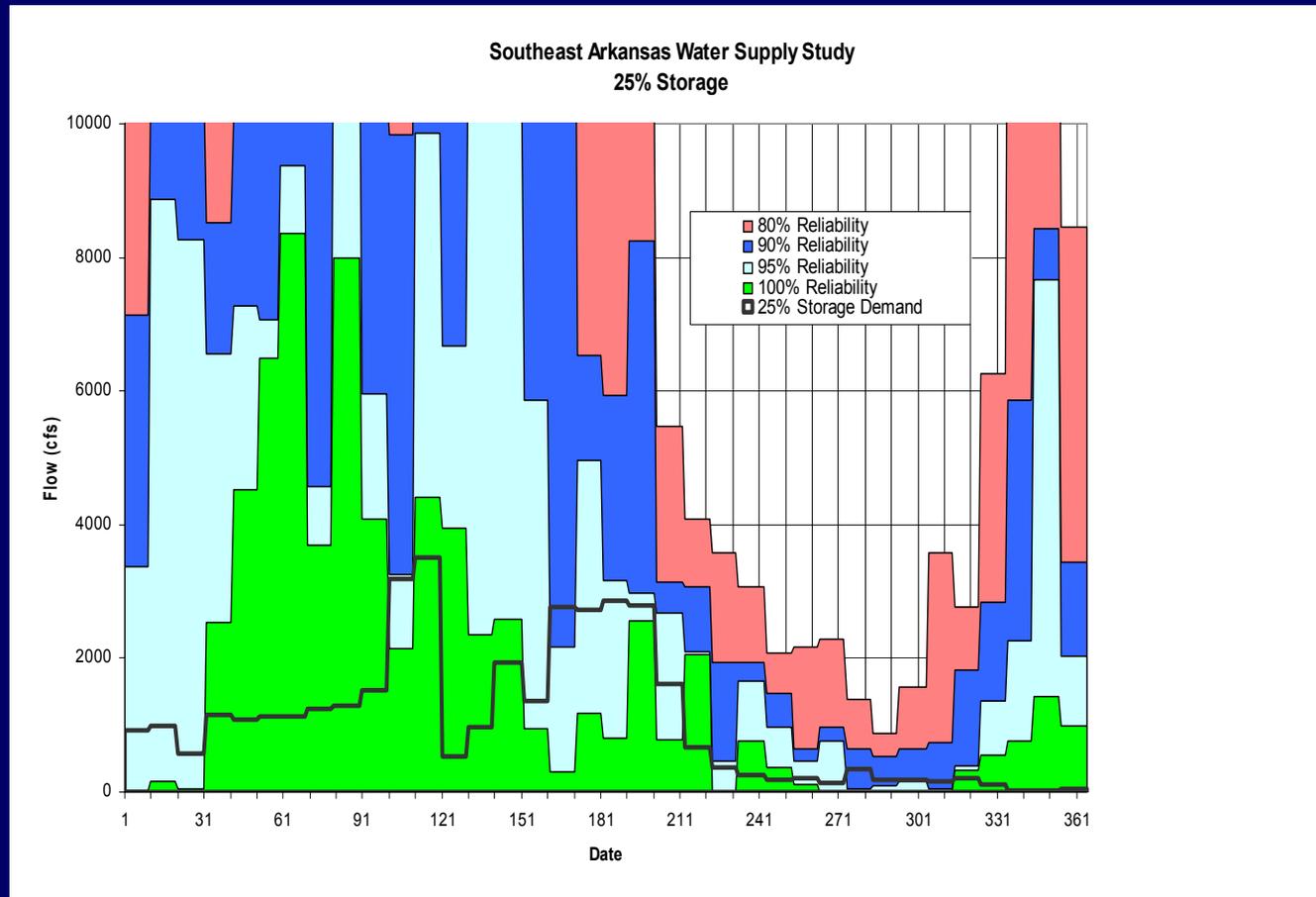
10% Storage





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25% Storage





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Environmental Analysis

- 1. Waterfowl - Analyze daily flooded acres (01 Nov – 28 Feb), considering depth and duration of flooding.**
- 2. Aquatics - Analyze daily flooded acres (01 Mar – 30 Jun), considering depth and duration of flooding.**



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Environmental Analysis (Cont'd)

- 3. Terrestrial - Analyze daily flooded wooded acres, considering seasonal durations.**
- 4. Wetlands – Analyze daily flooded acres, considering seasonal durations.**



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Work in Progress

- 1. Finish evaluation of Alternative 2 channel enlargement.**
- 2. Evaluate Alternative 3 (channel enlargement, possible flow diversions).**
- 3. Evaluate water supply requirements.**



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West Section Bayou Bartholomew



Description: looking downstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/23/2001 Original: 14_ds.jpg Filename: bth14ds.jpg



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West Section Deep and Jacks Bayous



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/24/2001 Original: 4b_us.jpg Filename: dpb4bus.jpg

Deep Bayou



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/24/2001 Original: 4b_a_us.jpg Filename: jb4baus.jpg

Jacks Bayou



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Middle Section - Big Bayou and Black Pond Slough



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 2/16/2001 Original: 9b_us.jpg Filename: bb9bus.jpg

Big Bayou



Description: looking downstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/23/2001 Original: 7b_ds.jpg Filename: bp7bds.jpg

Black Pond Slough



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Middle Section Boeuf River and Canal 18



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/23/2001 Original: 4b_us.jpg Filename: bfd4bus.jpg

Boeuf River (Diversion)



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 1/24/2001 Original: 8b_us.jpg Filename: c18_8bus.jpg

Canal 18



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Middle Section Canal 19



Description: looking at upstream face

Contract No.: DACW38-00-D-0002 Task Order No.: 008

Date: 1/24/2001 Original: 3b_usface.jpg Filename: c19_3bus_face.jpg



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East Section Ditch and Connerly Bayous



Description: looking downstream
Contract No.: DACW-38-00-D-0002 Task Order No.: 008
Date: 1/21/2001 Original: 2ds.jpg Filename: DB-2-DS

Ditch Bayou



Description: looking upstream
Contract No.: DACW38-00-D-0002 Task Order No.: 008
Date: 2/19/2001 Original: 2_us.jpg Filename: cb2us.jpg

Connerly Bayou

Department of the Army



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Future**

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Southeast Arkansas Feasibility Study

Thomas R. Brown, Hydraulics Engineer

Work phone: 601 631-5678

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Email: tommy.r.brown@usace.army.mil