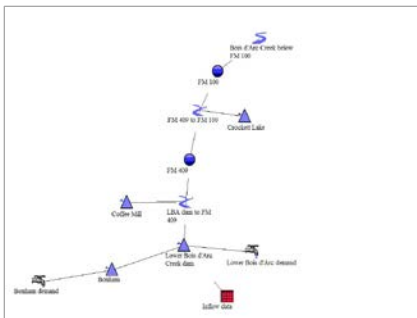
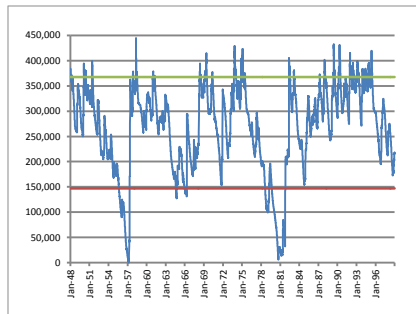


Instream Flow Study for the Proposed Lower Bois d'Arc Creek Reservoir, Texas

BY JON ALBRIGHT



RiverWare Users Group
February 1, 2012

Topics

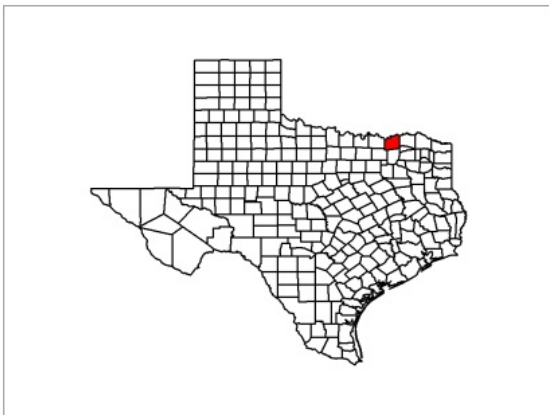


- Lower Bois d'Arc Creek Reservoir Instream Flow Study
- Challenges modeling environmental flows associated with the Texas Instream Flow Program

Lower Bois d'Arc Cr Reservoir



Owner	North Texas Municipal Water District
Surface Area	16,526 acres
Drainage Area	327 sq. miles
Storage	367,609 ac-ft
Supply	113 MGD
Avg/Max Depth	22 ft/70 ft
Elevation	534 ft msl



Instream Flow Study



- Based on Texas Instream Flow Program
- Multidiscipline
 - Field work
 - Modeling
- Objectives
 - Characterize existing conditions
 - Evaluate impacts of the proposed reservoir on Bois d'Arc Creek
 - Recommend a flow regime to maintain a Sound Ecological Environment



- Stream power to move sediment, but not create excessive erosion
- Support mesohabitat diversity
- Provide hydraulic connectivity
- Maintain water quality
- Support fish reproduction
- Maintain or improve fish and macroinvertebrate communities

Study Components



- Hydrology and Hydraulics
 - Flows over time (seasonally and long-term)
 - Hydraulic connectivity to support biology



Study Components



- Hydrology and Hydraulics
 - Flows over time (seasonally and long-term)
 - Hydraulic connectivity to support biology
- Fluvial Geomorphology
 - Sediment transport
 - Mesohabitats



Study Components



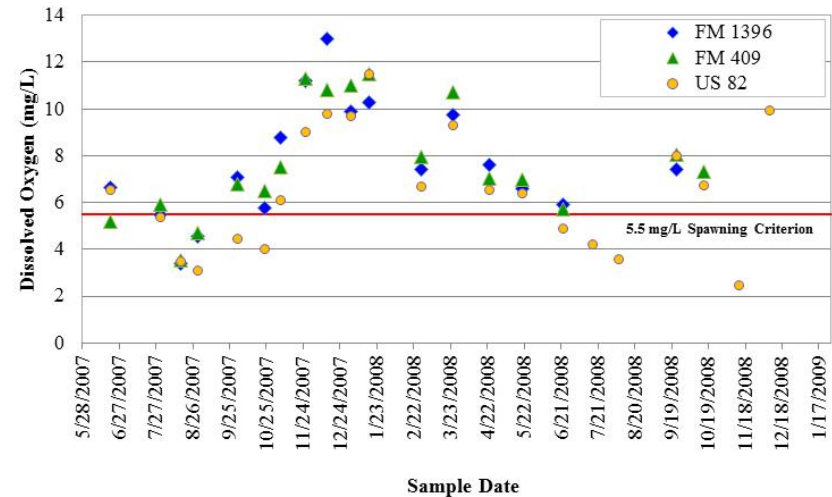
- Hydrology and Hydraulics
 - Flows over time (seasonally and long-term)
 - Hydraulic connectivity to support biology
- Fluvial Geomorphology
 - Sediment transport
 - Mesohabitats
- Biology
 - Fish and macroinvertebrates



Study Components



- Hydrology and Hydraulics
 - Flows over time (seasonally and long-term)
 - Hydraulic connectivity to support biology
- Fluvial Geomorphology
 - Sediment transport
 - Mesohabitats
- Biology
 - Fish and macroinvertebrates
- Water Quality
 - Dissolved oxygen and temperature





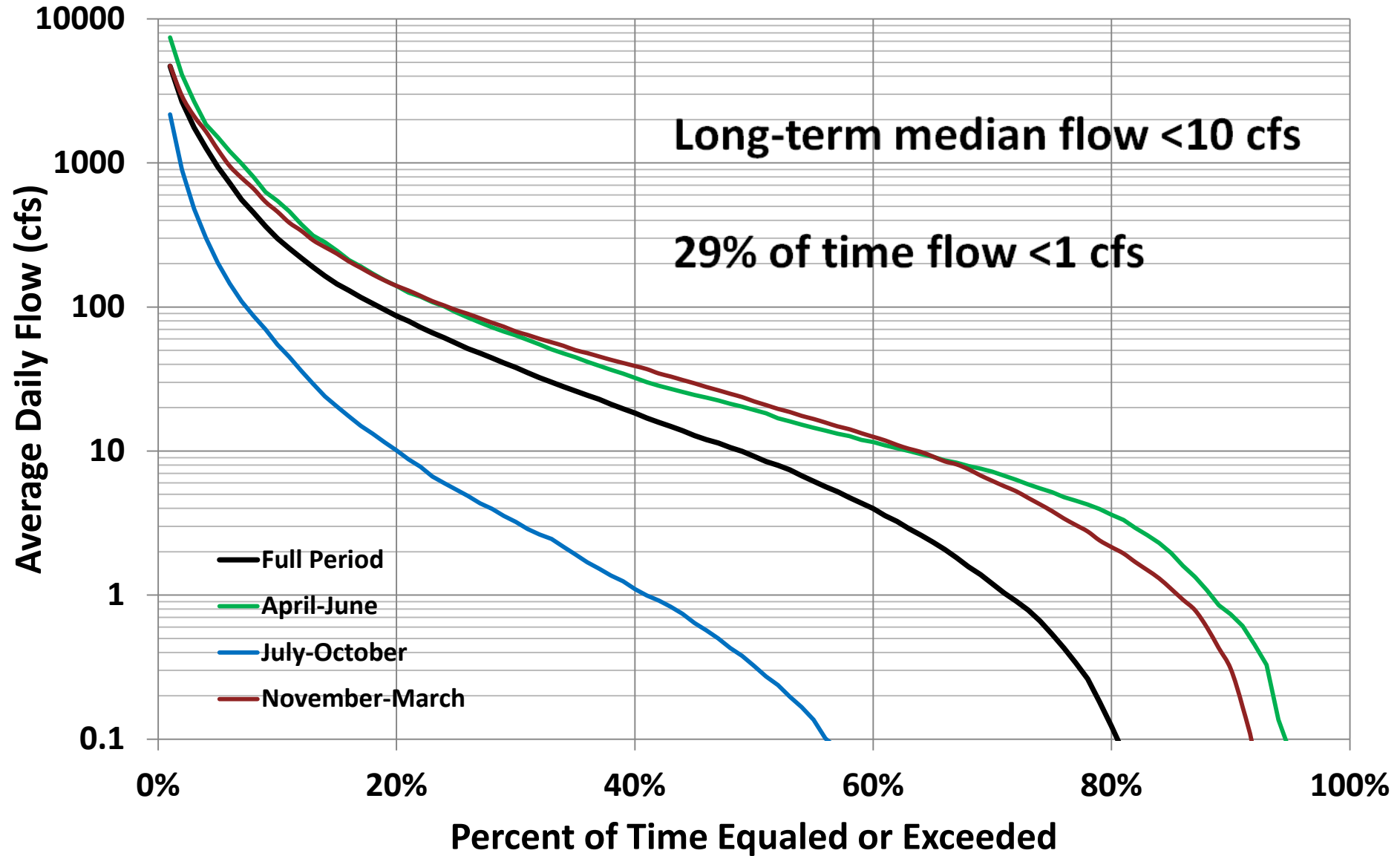
- Data Sources and Models:
 - USGS gages (Bois d'Arc Creek, North Sulphur, others)
 - Field data
 - Cross-section surveys and LiDar survey
 - HEC-RAS (hydraulics and habitat modeling)
 - Full model – high flows
 - Reach models – low flows
 - RiverWare (long-term watershed modeling)



- Limited historical data
 - Drainage area ratios and rainfall/runoff trends
 - Monthly Red River WAM flows to daily
 - Long-term behavior from RiverWare models
- Channelization
 - Flashy (rapid rise and fall)
 - Frequent high flows cause erosion
 - Extended periods of little to no flow



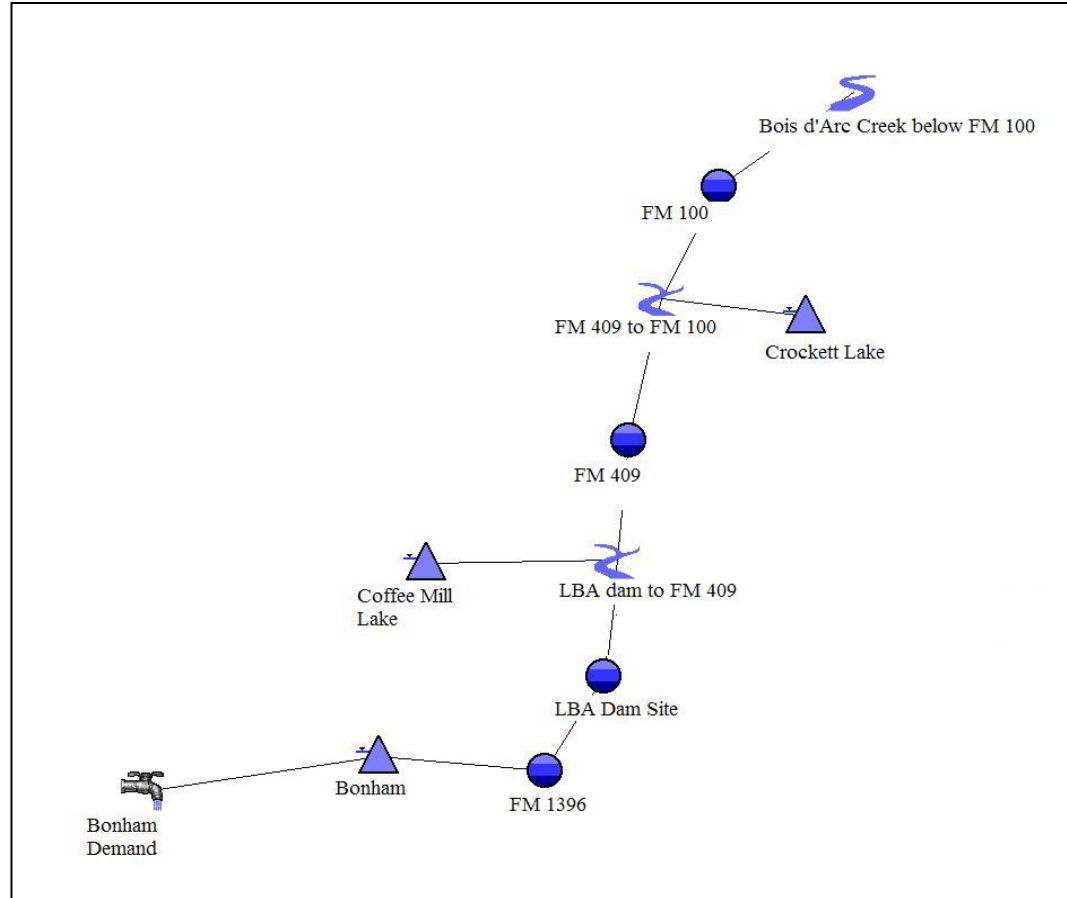
Flow Duration Curves



Existing Conditions



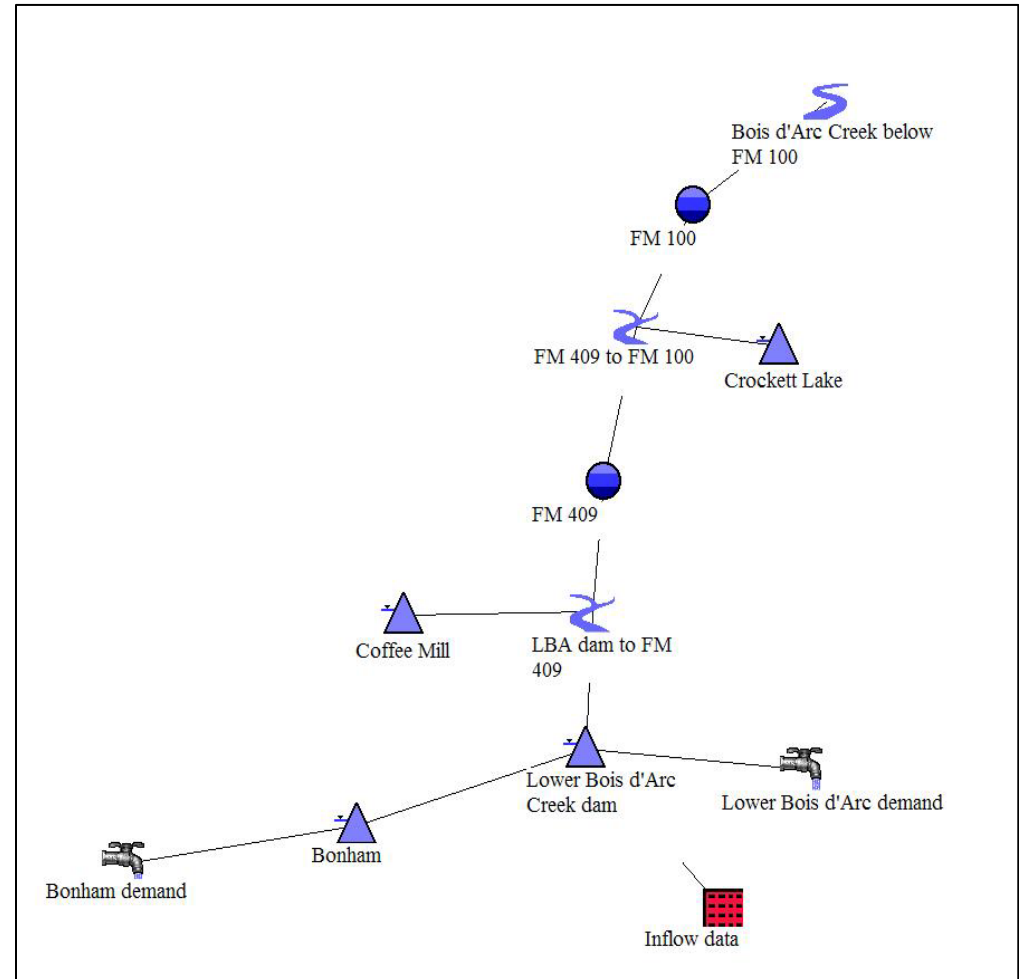
- Three Reservoirs
 - Lake Bonham
 - Coffee Mill Lake
 - Crockett Lake
- One water users
- Three reach objects
- Four control points
- Lake Bonham to Red River



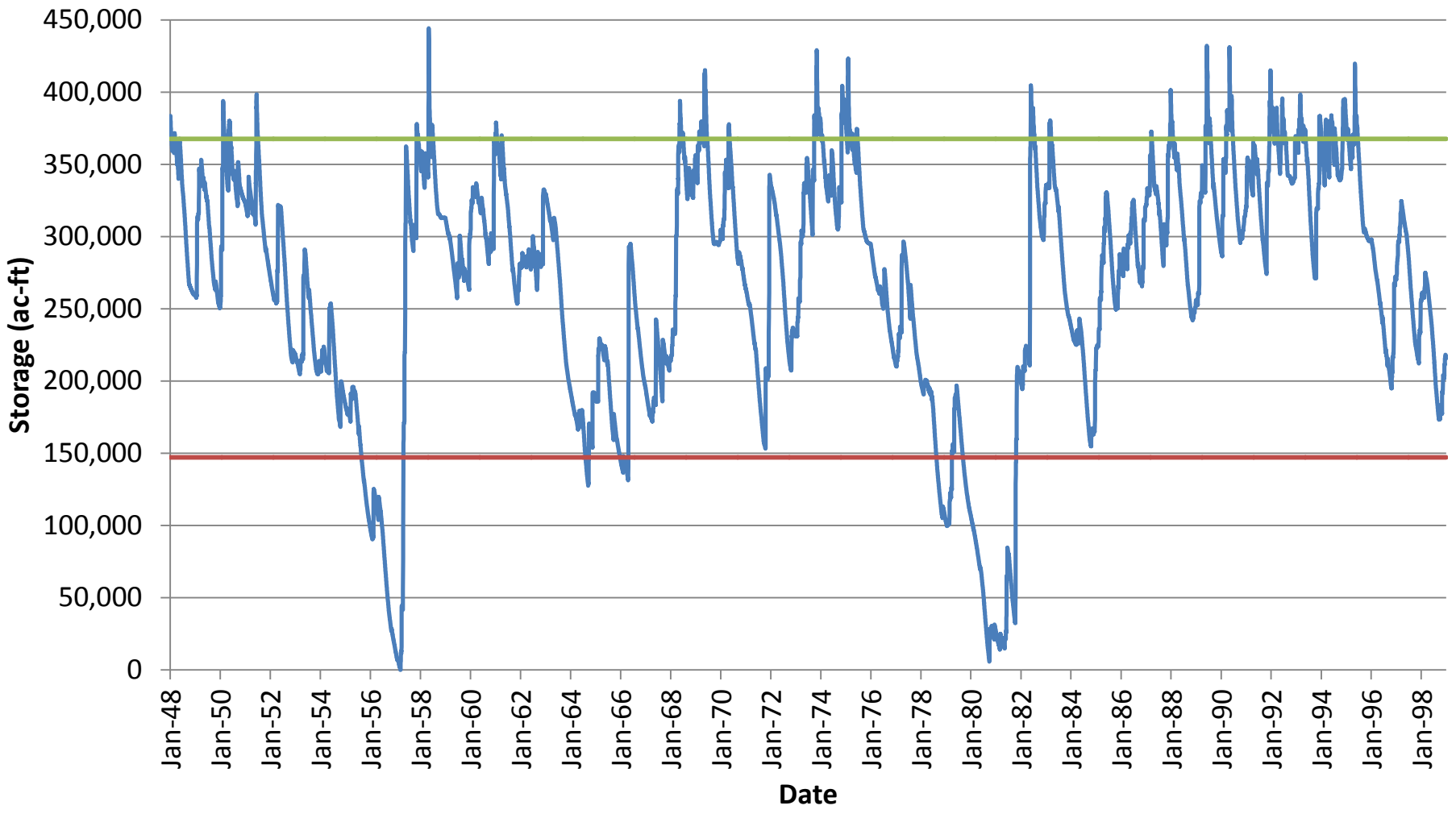
Future Conditions



- Four Reservoirs
 - Lake Bonham
 - Coffee Mill Lake
 - Crockett Lake
 - Lower Bois d'Arc Cr Reservoir
- Two water users
- Three reach objects
- Two control points



Reservoir Storage



— Lower Bois d'Arc Storage — 40% of Conservation Storage — Conservation Storage

Proposed Flow Regime



Flow Component	Release Amount* (cfs)	Condition	Duration
Subsistence	1	Drought	Based on Conditions

* Subsistence flow triggered when reservoir is less than 40 percent full. Pulse flow would be released seasonally if such flows do not occur naturally.

Proposed Flow Regime



Flow Component	Release Amount* (cfs)	Condition	Duration
Subsistence	1	Drought	Based on Conditions
Baseflow _a	3	Normal – Wet	July – March
Baseflow _b	10	Normal – Wet	April – June

* Subsistence flow triggered when reservoir is less than 40 percent full. Pulse flow would be released seasonally if such flows do not occur naturally.

Proposed Flow Regime



Flow Component	Release Amount* (cfs)	Condition	Duration
Subsistence	1	Drought	Based on Conditions
Baseflow _a	3	Normal – Wet	July – March
Baseflow _b	10	Normal – Wet	April – June
High Flow Pulse	50	Normal – Wet	1 in spring 1 in summer

- * Subsistence flow triggered when reservoir is less than 40 percent full. Pulse flow would be released seasonally if such flows do not occur naturally.

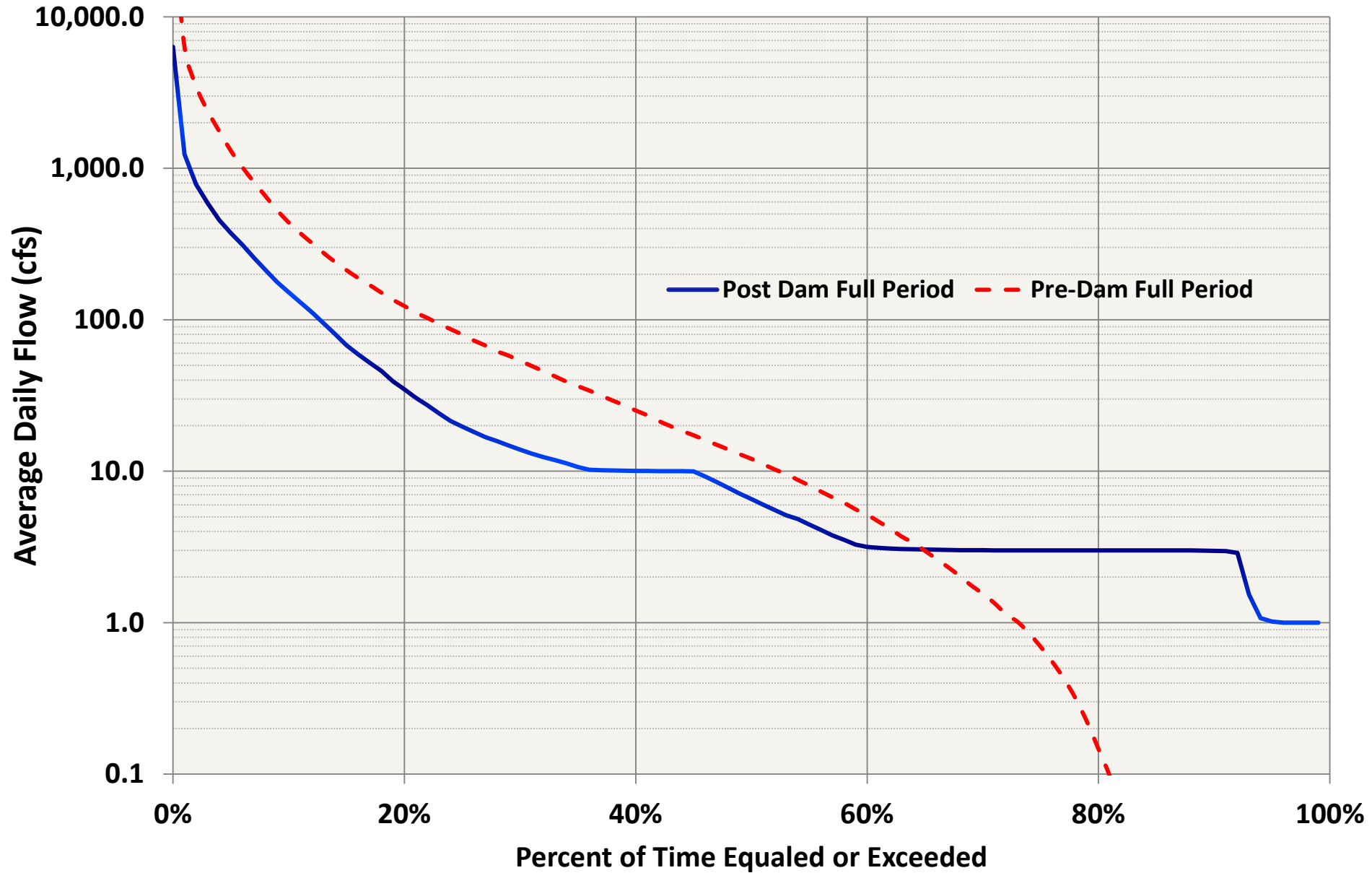
Proposed Flow Regime



Flow Component	Release Amount* (cfs)	Condition	Duration
Subsistence	1	Drought	Based on Conditions
Baseflow _a	3	Normal – Wet	July – March
Baseflow _b	10	Normal – Wet	April – June
High Flow Pulse	50	Normal – Wet	1 in spring 1 in summer
Overbank Flows	NA	NA	NA

- * Subsistence flow triggered when reservoir is less than 40 percent full. Pulse flow would be released seasonally if such flows do not occur naturally.

Proposed Flow Regime





- Base and pulse flows
- Monthly water availability models
- Pulses
 - Identification
 - Prediction
- Credit for pulses
 - Without a release
 - With a partial release



The proposed instream flow regime for the Lower Bois d'Arc Creek Reservoir is under review by the Texas Commission on Environmental Quality as part of its processing of the North Texas Municipal Water District's application for a water right permit for the project. No approval or acceptance of the proposed flow regime has been issued by any state or federal regulatory agency as of this date.

Acknowledgements



- Project Sponsor: North Texas Municipal Water District
- Field Data Collection:
 - Texas Commission on Environmental Quality
 - Texas Parks and Wildlife Department
 - Texas Water Development Board
 - Freese and Nichols, Inc.
- Technical analyses:
 - Simone Kiel
 - Steve Watters
 - Stephanie Coffman
 - Randall Howard

