UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

STATE OF GEORGIA,

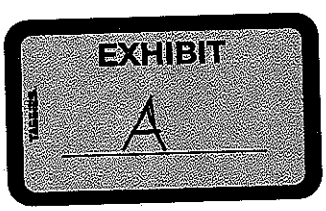
Plaintiff,

v.

THE UNITED STATES ARMY CORPS OF ENGINEERS; FRANCIS J. HARVEY, in his official capacity as Secretary of the United States Army; JOHN P. WOODLEY, JR., in his official capacity as Assistant Secretary of the United States Army for Public Works; LIEUTENANT GENERAL CARL A. STROCK, in his official capacity as Commander and Chief of Engineers, United States Army Corps of Engineers; BRIGADIER GENERAL MICHAEL J. WALSH, in his official capacity as Division Commander, South Atlantic Division, United States Army Corps of Engineers; and COLONEL PETER F. TAYLOR, JR., in his official capacity as District Commander, Mobile District, United States Army Corps of Engineers,

Defendants.

Civil Action
File No. 1:06-CV-1473



DECLARATION OF WEI ZENG, Ph.D.

I, WEI ZENG, declare and state as follows:

1. I am over 21 years of age and am under no legal disability. I make this declaration of my own personal knowledge based upon information known to or made available to me in the execution of my professional responsibilities.

2. I am Program Manager of the Water Resources Basin Analysis Unit of the Environmental Protection Division of the Georgia Department of Natural Resources (Georgia EPD).

3. I hold a Bachelor's in Engineering Degree from Tsinghua University, Bejing, China, and a Ph.D. from the University of Georgia. The emphasis of my graduate study was water resources. I am certified as a Professional Hydrologist with the American Institute of Hydrology.

4. I have been an Environmental Engineer with Georgia EPD since December 2000. I have more than 10 years of experience in water resources analysis and hydrologic and hydraulic modeling. In my graduate studies at the University of Georgia, I studied various mathematical models of river systems. I developed my own computer model and calibrated it to an existing river system. I

authored papers concerning applications of this model that were published in the *Journal of Hydrology* and *Water Science and Technology*. I have received formal training from the Corps in computer models developed by the Corps to simulate reservoir operations.

5. For the past 5 years, I have provided scientific and technical analysis to support the State of Georgia's discussions with the States of Florida and Alabama and the United States Army Corps of Engineers ("Corps") regarding reservoir operations and water resources allocation in the Apalachicola-Chattahoochee-Flint ("ACF") River Basin and the Alabama-Coosa-Tallapoosa ("ACT") River Basin.

6. My work in support of the ACF and ACT River Basin discussions has involved primarily utilization of the computer model for reservoir operational simulation that is known as "HEC-5, Simulation of Flood Control and Conservation Systems."

7. HEC-5 was developed by the Corps and currently is used throughout the world for comprehensive simulation of reservoir system operations. The Corps and the States of Georgia, Alabama, and Florida developed the HEC-5 model platform for the ACF Basin to simulate the operation of reservoir systems within

the Basin, and it was utilized extensively by the States, the Corps, other federal agencies, and stakeholders throughout the ACF Compact discussions.

8. I have used the HEC-5 model for analysis of operational scenarios in the ACF Basin for the past 5 years. I also am proficient in a number of water resources computer models in addition to HEC-5, including HEC-6, HEC-HMS, HEC-ResSim, HEC-RAS, and Basins/HSPF.

9. A copy of my Curriculum Vitae is attached as Exhibit 1.

10. I have developed HEC-5 model datasets to determine the impact of operating the federal reservoirs in the ACF Basin in accordance with the Interim Operations Plan ("IOP") that the Corps announced in its March 7, 2006 letter to the U.S. Fish and Wildlife Service. *See* Georgia Complaint, Doc. No. 1, Exhibit A.

11. I have prepared memoranda summarizing the results of model datasets that simulate the IOP. These memoranda, dated May 5, 2006 and June 1, 2006, discuss the facts assumed within and results generated by the model datasets. Copies of those memoranda were attached to correspondence from Dr. Carol Couch, Director of Georgia EPD, to Colonel Peter Taylor of the Corps and Ms. Gail Carmody of the U.S. Fish and Wildlife Service dated May 5, 2006 and June 2, 2006. *See* Georgia Complaint, Doc. No. 1, Exhibits B and F.

12. The HEC-5 models referred to by my memorandum of May 5, 2006 assume that Corps' reservoir operations, except as modified by the Corps' Interim Operations, are according to the Corps' Existing Conditions model. The Existing Conditions model assumes that operations of the four federal reservoirs in the ACF Basin are generally consistent with the Corps' actual implementation of the 1989 draft Water Control Plan. I have used the Existing Conditions model because it was jointly developed by the Corps and the States of Georgia, Florida and Alabama during the ACT/ACF Comprehensive Water Resources Study, and was approved by all three States in August 1997 as a platform for modeling proposals formulated in the ACF Compact formula negotiations.

13. These models show, under the IOP and Existing Conditions operations, the entire ACF system would be severely impacted, with lake levels reaching historical lows in this year or next year, given the historical hydrological conditions that occurred in the years 2000 and 2001. Furthermore, when a flow requirement of 8000 cfs is imposed in the month from June to next February (non-spawning season for Gulf Sturgeon), all the federal reservoirs would be emptied.

14. In a May 24 to 25, 2006 technical workshop held by the Corps and U.S. FWS, we learned that the Corps based their technical analysis on a different

platform model, the ACF "Black and White" model. This platform model closely reflects what was written in the proposed 1989 ACF Water Control Plan, including hydropower requirements, rule curves of reservoirs, and stream flow requirements at various locations along the Chattahoochee River and the Apalachicola River.

15. Since then, I have assembled HEC-5 models to simulate the impacts of the IOP based on the "Black and White" platform model. My memorandum to Dr. Carol Couch, Director of Georgia EPD, dated June 1, 2006, summarized the assumptions and conditions of these models, as well as their results. *See* Georgia Complaint, Doc. No. 1, Exhibit F.

16. These model results show that when the IOP is imposed upon the Water Control Plan as written, the federal reservoirs would reach the bottom of their conservation pools and stay there for prolonged periods, causing catastrophic impacts throughout the basin.

17. In a letter dated June 12, 2006 from Colonel Taylor to Dr. Carol Couch, the Corps claimed that the modeling results discussed in my June 1, 2006 memorandum "included assumptions that high firm hydropower generation would occur at all of the ACF projects, beginning at a full pool level, and continuing unabated until each pool in the system is drained." *See* Georgia Complaint, Doc.

No. 1, Exhibit H. The letter stated that this assumption was invalid because the Corps operates the ACF Basin reservoirs using a "zone" operation and reduces hydropower production as lake levels decline. The letter included charts showing the seasonal daily minimum hours of hydropower generation at the ACF Basin reservoirs assumed in Georgia's model versus the Corps' models, and a chart purporting to show "that without imposing high firm hydropower demands on the ACF reservoirs during drier than normal and drought periods, reservoir levels will not decline precipitously, and in fact can be expected to be higher with the IOP in-place than have occurred historically on the system."

18. I have now run a HEC-5 model simulation of the IOP using the daily minimum hours of hydropower generation assumed by the Corps according to the Corps June 12, 2006 letter. The results of this simulation are discussed in the attached memorandum from me to Carol Couch dated June 20, 2006 attached hereto as Exhibit 2. This simulation shows that Lanier still would fall to four feet below its historical low, potentially impacting water supplies.

19. None of the above-discussed model simulations prepared by the State of Georgia assumes any release by the Corps of Engineers during dry times in excess of the percentage of Basin Inflow that the IOP states that the Corps is to

release. In fact, however, the Corps has consistently released in excess of the required percentage of Basin Inflows. If one assumes over-releases of the required percentage of Basin Inflows, the result is an even greater drain on the federal reservoirs. In particular, none of the above-discussed model simulations prepared by the State of Georgia assumes the release by the Corps of Engineers of approximately 22.5 billion gallons of water (approximately 6% of Lake Lanier's conservation storage) in excess of the percentage of Basin Inflows that the Corps is required to release under the IOP, as actually occurred. If assumed in the above computer models, the effect of this particular over-release would be to lower the levels of the federal reservoirs significantly. Such effects are discussed further in my memorandum dated June 20, 2006.

I certify under penalty of perjury that the foregoing is true and correct.

Executed on June 21, 2006.

Wei Zeng

Sworn to before me this

21st day of June 2006

Brenda J. Cakestraw
Notary Public

My Commission Expires: 9/13/07

Curriculum Vitae

Wei Zeng

760 Downyshire Court, Lawrenceville, GA 30044
(404)-463-2883
Email: weiz@yahoo.com

Experienced environmental professional who is constantly seeking challenging tasks in solving water resources problems and protecting the environment

SUMMARY:

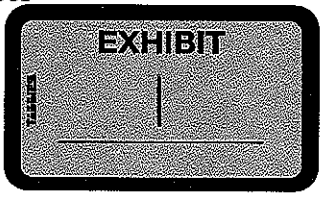
- **More than 10 years of experience in water resources analysis and hydrologic and hydraulic modeling.**
- **Proficiency in a variety of water resources models, including HEC-5, HEC-6, HEC-HMS, HEC-ResSim, HEC-RAS, and BASINS/HSPF.**
- **Excellent computer skills. Experienced in MATLAB/SIMULINK, STELLA, and C/C++. Working knowledge in GIS.**
- **Excellent communication skills (Competent Toastmaster and Competent Leader recognitions by Toastmasters International). Fluent in both English and Chinese.**
- **Effective problem-solver. Given highest Performance Evaluation (Exceed Expectation) for the past 4 consecutive years. Recipient of Meritorious Pay Increase as a result of performance above and beyond requirement.**

PROFESSIONAL EXPERIENCE:

Program Manager
April 2006 – present
Department of Natural Resources, Environmental Protection Division
State of Georgia

- Leading the Water Resources and Hydrological Analysis Unit to provide technical support for the State of Georgia's continuous involvement in water resources disputes with the States of Alabama and Florida.
- Leading the Unit to provide mathematical modeling and technical analysis for comprehensive water resources planning tasks.
- Leading the Unit to provide mathematical modeling in the Map Modernization effort to update flood insurance maps in the State of Georgia.

Environmental Engineer
December 2000 – January 2002
Senior Environmental Engineer
February 2002 – June 2003



Curriculum Vitae

Principal Environmental Engineer
July 2003 – March 2006
Department of Natural Resources, Environmental Protection Division
State of Georgia

- Conducted technical support for the State of Georgia's continuous involvement in water resources disputes with the States of Alabama and Florida.
- Conducted HEC-RAS modeling for Map Modernization efforts in Georgia counties.
- Conducted surface water hydrologic modeling (BASINS/HSPF developed by the U.S. Environmental Protection Agency) of the Flint River Basin to protect surface water availability and aquatic communities (including Federally Endangered species).
- Conducted research of water resources related issues using a hydrologic model (HEC-ResSim developed by the Army Corps of Engineer) in Savannah River Basin.
- Provided scientific analysis and technical support (HEC-5 model simulations, Stella model simulations, and data analysis) for the Apalachicola-Chattahoochee-Flint (ACF) and Alabama-Coosa-Tallapoosa (ACT) river basin water resources allocation negotiations (known as Tri-State Water Wars) among the States of Georgia, Florida and Alabama.
- Provided technical support for other tasks that involve the Water Resources Branch and Water Resources Management Program of Georgia EPD.

Graduate research assistant
September 1996 – December 2000
Warnell School of Forest Resources
University of Georgia

- Developed a mathematical model STAND (Sediment-Transport-Associated Nutrient Dynamics) for the study of sediment-transport-related water quality problems;
- Conducted field work to obtain water and sediment samples and water quality data for the calibration and validation of STAND;
- Calibrated and Validated STAND;
- Applied STAND in water quality management and river engineering.

Assistant engineer
July 1992 – September 1996
Department of Sedimentation Engineering
China Institute of Water Resources and Hydropower Research (IWHR)

- Conducted physical model study, as a member of a research team, on fluvial processes of the confluence area of the Yellow River and the Weihe River, one of its major tributaries.
- Conducted laboratory study, as a member of research team, of special sediment phenomena on the middle reaches of the Yellow River;
- Led physical model study on urbanization-caused floods in Shenzhen Special Economic Zone, Southern China;

Curriculum Vitae

- Developed a computational platform for the analysis of sediment transport by size fractions on the lower reaches of the Yellow River;

EDUCATION:

- **Ph.D. in Water Resources**
  (Ph.D. Dissertation: A Model for Understanding and Managing the Impacts of Sediment Behavior on River Water Quality)
  Warnell School of Forest Resources
  University of Georgia
  December, 2000
- **B.E. in Hydraulic Engineering**
  Department of Hydraulic Engineering
  Tsinghua University, Beijing, China
  July, 1992

AWARD AND RECOGNITIONS:

1. Best Theoretical Paper Award to O. O. Osidele, Wei Zeng, and M. B. Beck (by the Environmental & Water Resources Institute of the American Society of Civil Engineers) for the theoretical paper entitled "Coping with Uncertainty: A Case Study in Sediment Transport and Nutrient Load Analysis", ASCE Journal of Water Resources Planning and Management, Vol. 129, No. 4, July/August 2003, pp. 345-355.
2. Competent Toastmaster Recognition to Wei Zeng by Toastmasters International for completion of the Toastmaster International Communication and Leadership Program, April 1, 2005.
3. Competent Leader Recognition to Wei Zeng by Toastmasters International for achievement in the Toastmasters International Leadership Program, January 18, 2006.

PROFESSIONAL CERTIFICATION/AFFILIATION:

1. Professional Hydrologist, American Institute of Hydrology, license number 05-H-1645
2. Member, American Geophysical Union

SELECTED PUBLICATIONS:

1. Osidele, O.O., **Zeng, W.**, and Beck, M.B. (2005). "A random search methodology for examining parametric uncertainty in water quality models", *Water Science and Technology* (in press).

Curriculum Vitae

2. **Zeng, W.** and Beck, M.B. (2004). Reply to "Comments on 'Stand, a dynamic model for sediment transport and water quality' by W. Zeng and M.B. Beck, 2003. *Journal of Hydrology* 277, 125-133", *Journal of hydrology*, Vol. 297, pp. 305-307.
3. Osidele, O.O., **Zeng, W.**, and Beck, M.B. (2003). "Coping with uncertainty: a case study in sediment transport and nutrient load analysis", *Journal of Water Resources Planning and Management*, Vol. 129, No. 4, pp. 345-355.
4. **Zeng, W.** and Beck, M.B. (2003). "STAND, a dynamic mathematical model for sediment transport and beyond", *Journal of Hydrology*, Vol. 277, pp.125-133.
5. **Zeng, W.** and Beck, M.B. (2001). "Development and evaluation of a mathematical model for the study of sediment-related water quality issues", *Journal of Water Science and Technology*, Vol. 43, No. 7, pp.47-54.
6. **Zeng, W.** (2000). "A Model for Understanding and Managing the Impacts of Sediment Behavior on River Water Quality", Ph.D. Dissertation, The University of Georgia.
7. Zhou, S., **Zeng, W.**, and Wang, J. (1995). "Analysis on characteristics of the Maozhou River", *Journal of Sediment Research*, 4th quarterly 1995 (in Chinese).

CONFERENCES:

1. **Zeng, W.**, McMahon, G.F., and Hawkins, D.E. (2005). "Modeling for conflict resolution using parameterization of operations and strong stakeholder initiatives", Proceedings of the 2005 Georgia Water Resources Conference, Athens, Georgia, April, 2005.
2. **Zeng, W.** and Wen, M. (2005). "Constructing a hydrologic model of the Ichawaynochaway Creek watershed", Proceedings of the 2005 Georgia Water Resources Conference, Athens, Georgia, April, 2005.
3. Osidele, O.O., **Zeng, W.**, and Beck, M.B. (2003). "Uncertainty evaluation of sediment loading and transport for the Chattahoochee River at Atlanta, Georgia", Preprint, TMDL 2003, Water Environment Federation.
4. **Zeng, W.** and Beck, M.B. (2000). "Development and evaluation of a mathematical model for the study of sediment-related water quality issues", The 5th International Symposium on Systems Analysis and Computing in Water Quality Management, Ghent, Belgium, September 2000.
5. **Zeng, W.** and Beck, M.B. (1999). "Evaluating a model for assessing the interactions between sediments and water quality", Proceedings of the 3rd International Symposium on Ecohydraulics, Salt Lake City, Utah, July 1999.
6. **Zeng, W.** and Beck, M.B. (1999). "Stream sediment transport and associated water quality modeling", Proceedings of the 1999 Georgia Water Resources Conference, Athens, Georgia, March 1999.
7. Chen, J., **Zeng, W.**, Zeng, Q. (1995). "Influence of submerged dike on flow structure", Advances in Hydro-Science and -Engineering, Proceedings of the 2nd International Conference on Hydro-Science and -Engineering, 1995.

Curriculum Vitae

PROFESSIONAL JUDGESHIP:

1. Reviewer, ASCE's (American Society of Civil Engineers) Journal of Hydrologic Engineering.
2. Reviewer, Journal of American Water Resources Association.
3. Reviewer, ASCE (American Society of Civil Engineers) Press.
4. Zeng, W. and Beck, M.B. (1998). "Book Review: Muddy Waters: Uncertainty Issues in Modelling the Influence of Bed Sediments on Water Composition, by van der Perk, M., Netherlands Geographical Studies, Utrecht, The Netherlands, 1996.", *Journal of Hydrology*, Vol.211, 1998.

Memorandum

To: Carol Couch
From: Wei Zeng
Date: June 20, 2006
Re: Modeling the Interim Operation Plan with the latest information

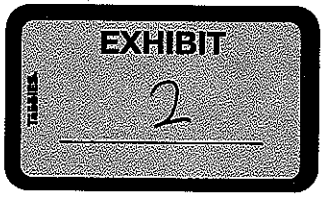
The purpose of this memorandum is to provide you with the latest technical analysis of the Army Corps of Engineer's (Corps) Interim Operation Plan (IOP).

Even though we assembled our earlier models based on commonly recognized platform models and the proposed 1989 Apalachicola-Flint-Chattahoochee River Basin Water Control Plan (WCP), we value and welcome any additional information from the Corps as to how technical analysis or actual operations were conducted by the Corps.

With the information on firm hydropower generation requirement provided by Colonel Taylor's letter to you dated June 12, 2006, we revised the firm power requirement in our models. Simulations of the IOP with the reduced firm hydropower requirement were then carried out in order to understand the effects of the IOP.

This memorandum contains summary of three simulations. The assumptions in reservoir operations, water demands, firm hydropower generation requirements, and in-stream flow requirements in these models are identical. These assumptions include, WCP rule curves at all four federal reservoirs, firm hydropower requirement specified in Colonel Taylor's June 12, 2006 letter to you, Georgia's year 2000 recorded municipal and industrial water demands, Georgia's dry year agricultural water demands, in-stream flow requirement at Atlanta, Georgia (750 cfs), in-stream flow requirement at Columbus, Georgia (1850 cfs unless West Point elevation is lower than 621.6 feet msl, when the requirement is lowered to 1200 cfs), and IOP flow requirement (except F062106, which does not have the IOP flow requirement) downstream of Jim Woodruff Dam. The storage at all four federal reservoirs is used to satisfy the IOP flow requirement, and these reservoirs are balanced to the extent permitted by WCP action zones.

The differences among these models are the period of simulation, initial conditions, and whether there is an IOP flow requirement downstream of Jim Woodruff Dam. The first model (F062006) provides a simulation of the IOP for the period of record (1939 through 2001) when the unimpaired data set is available. The second model has initial reservoir levels set as actual levels recorded by the Corps on June 19, 2006, and only simulates under the hydrological conditions recorded from 1998 to 2001. In light of the finding that the Corps has been using a faulty gage at Lanier reporting overly optimistic lake elevations, the purpose of the latter is to project into the future to see what would happen if (1) the ACF system is operated under the IOP starting with the latest and correct reservoir levels, and (2) the historical drought at the turn of the centuries were to repeat itself in the next few years. The third model is similar to F062006, except that it does not have the IOP flow requirement downstream of Jim Woodruff Dam. The purpose of this



model is to show the impact of the IOP itself instead of any other factors that may affect the simulations. Table 1 lists these differences in these models.

Table 1. Conditions in Georgia's latest HEC-5 models

Model Identifier	Period of Simulation	Initial Reservoir Levels	IOP Flow Requirement
F062006	January 1, 1939 – December 31, 2001	Full pool at all ACF federal reservoirs	Imposed
F0620V4	June 20, 1998 – December 31, 2001	As recorded on June 20, 2006	Imposed
F062106	January 1, 1939 – December 31, 2001	Full pool at all ACF federal reservoirs	None

The computation results are illustrated in Figs. 1 through 9. Fig. 1 shows simulated Lanier elevation for the entire period of simulation and for the short-term period. Results of F062006 are shown in blue, with F0620V4 shown in red, and F062106 shown in green. For comparison, observed Lanier elevation time series is shown in black. Although with the reduced firm hydropower requirement, Lanier would not be drained completely, it is apparent that Lanier elevation would decline to levels below historical low for several times given historical drought conditions in the 1950's, the 1980's, and 2000. The lowest level Lanier would reach under the IOP is 1048 feet msl, which is more than four feet below the historical low. Such low lake levels would severely impact public water supply utilities whose intakes are not deep enough. Consequently, such utilities would lose their capacity to draw enough water to supply their customers.

Figs. 2 and 3 show more detailed comparison of the simulated elevation and the observed one in the 1980's drought and the 1999-2001 drought. The Lanier elevation under the IOP (blue) is consistently lower than the historical (black), by substantial margin (e.g. more than 5 feet) at times, while the simulation without the IOP (green) shows Lanier elevations closely following the historical record. The impact of the IOP to Lanier can be clearly seen by comparing the blue curve with the green one. The short-term simulation (in red) shows how starting with a lower Lanier elevation (by an erroneous gauge) does more harm to the lake and the people depending on it.

Elevations of West Point and Walter F. George (Eufala) are shown in Figs. 4 through 9. Similar to what would happen to Lanier, West Point and Walter F. George would have much lower levels under the IOP than without it. The impact of that difference on water supply, water quality, fish species, recreation, and other interest needs to be further analyzed.

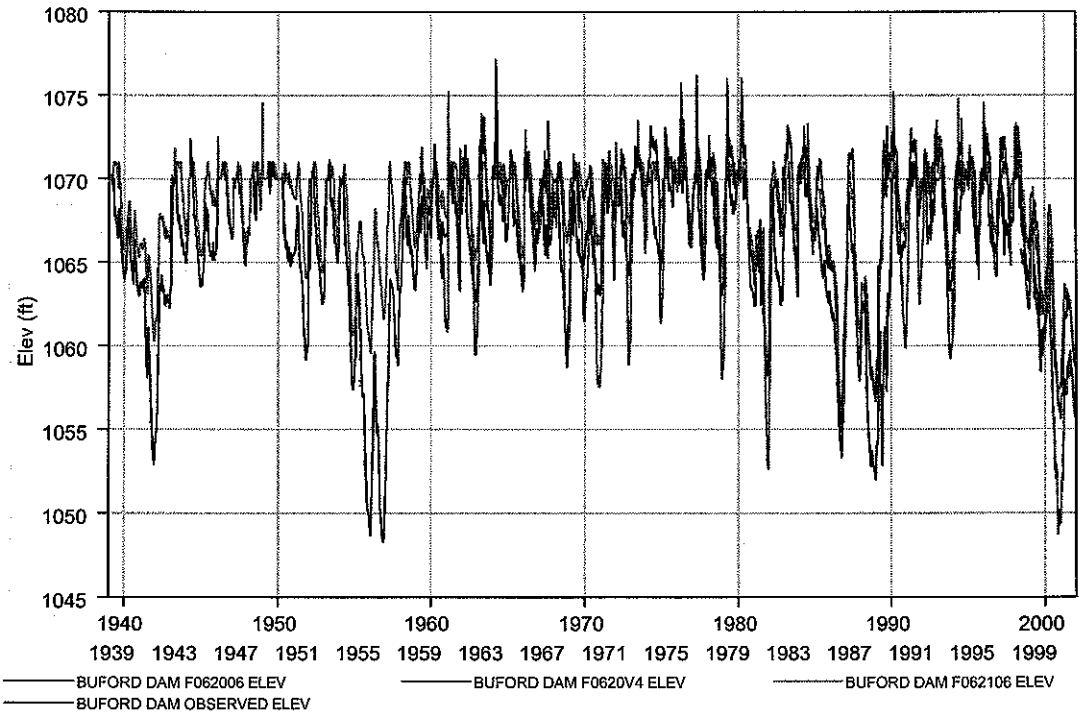


Fig. 1 Simulated and observed Lanier elevations

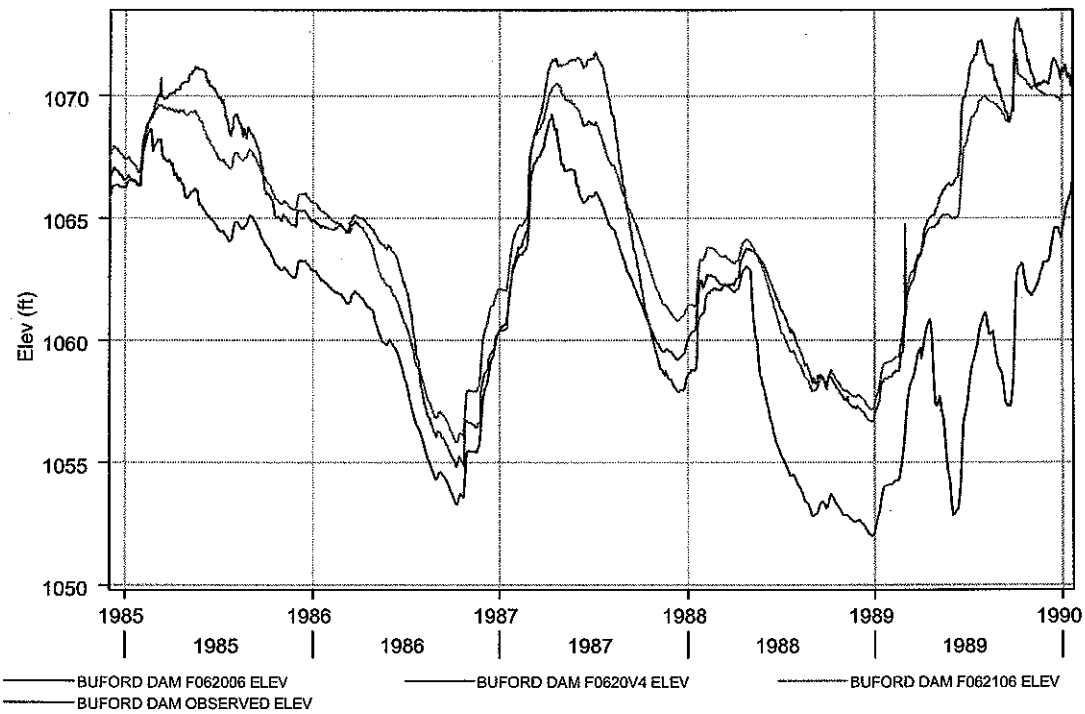


Fig. 2 Simulated (only F062006) and observed Lanier elevations (1980's)

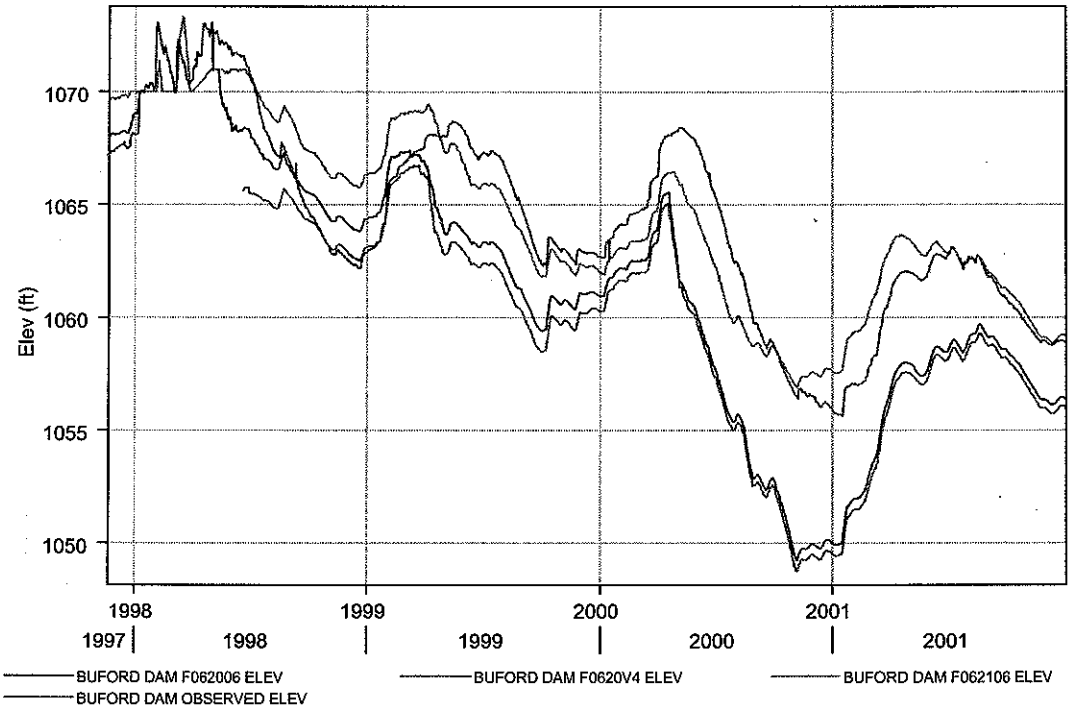


Fig. 3 Simulated and observed Lanier elevation (turn of the century)

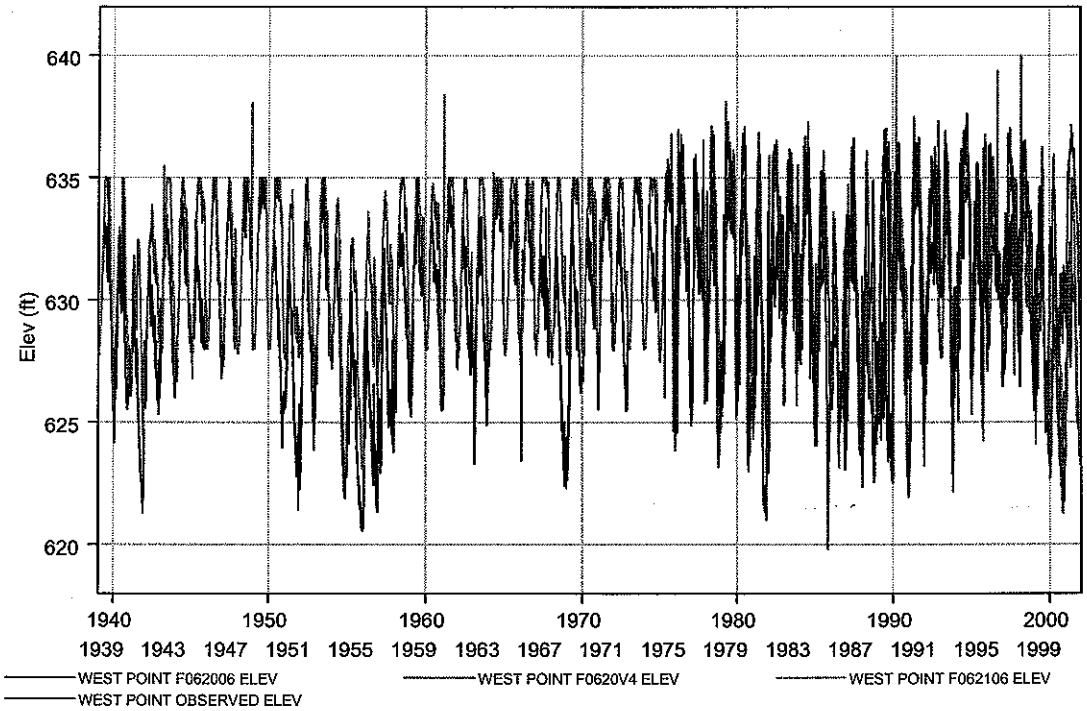


Fig. 4 Simulated and observed West Point elevation

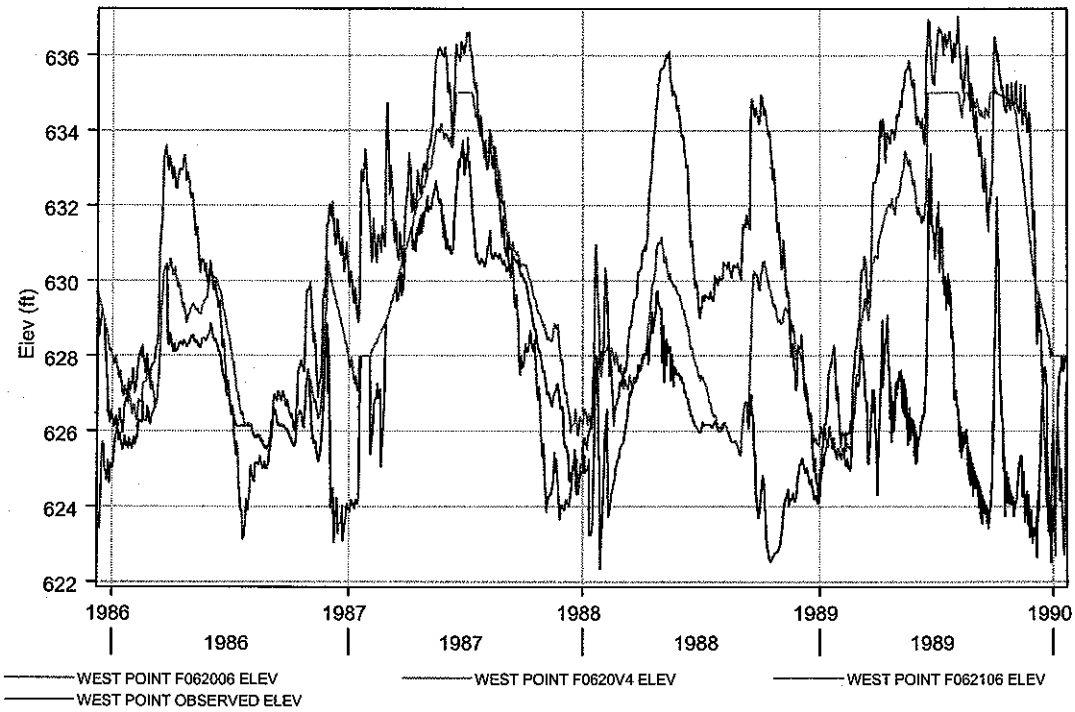


Fig. 5 Simulated (only F062006) and observed West Point elevation (1980's)

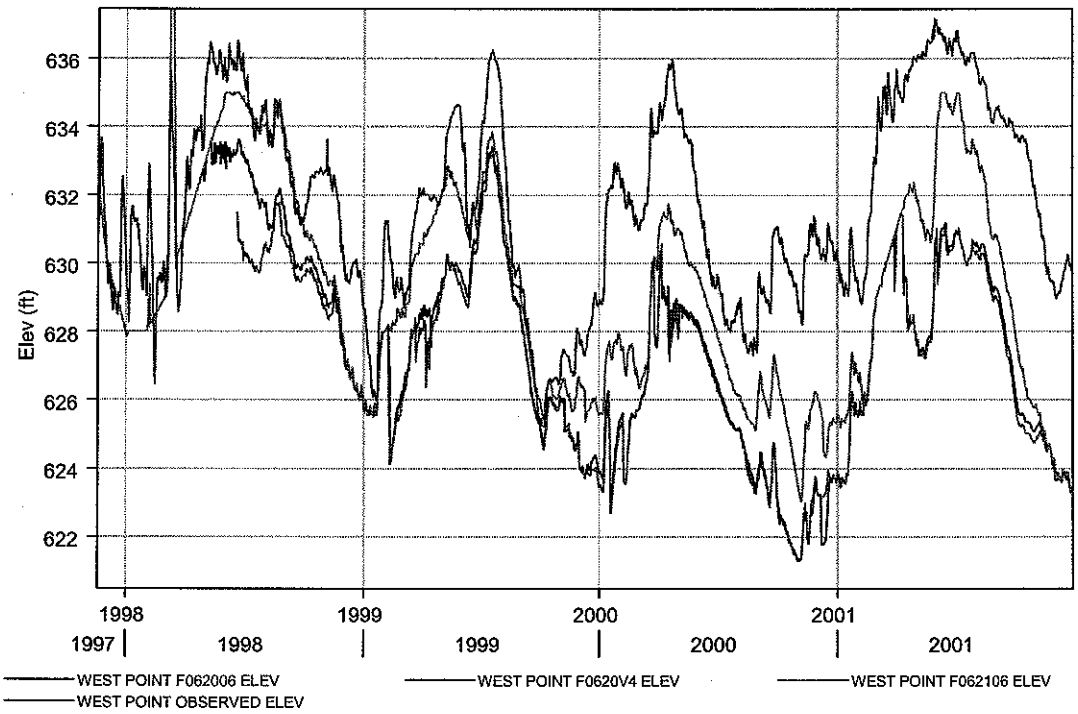


Fig. 6 Simulated and observed West Point elevation (turn of the century)

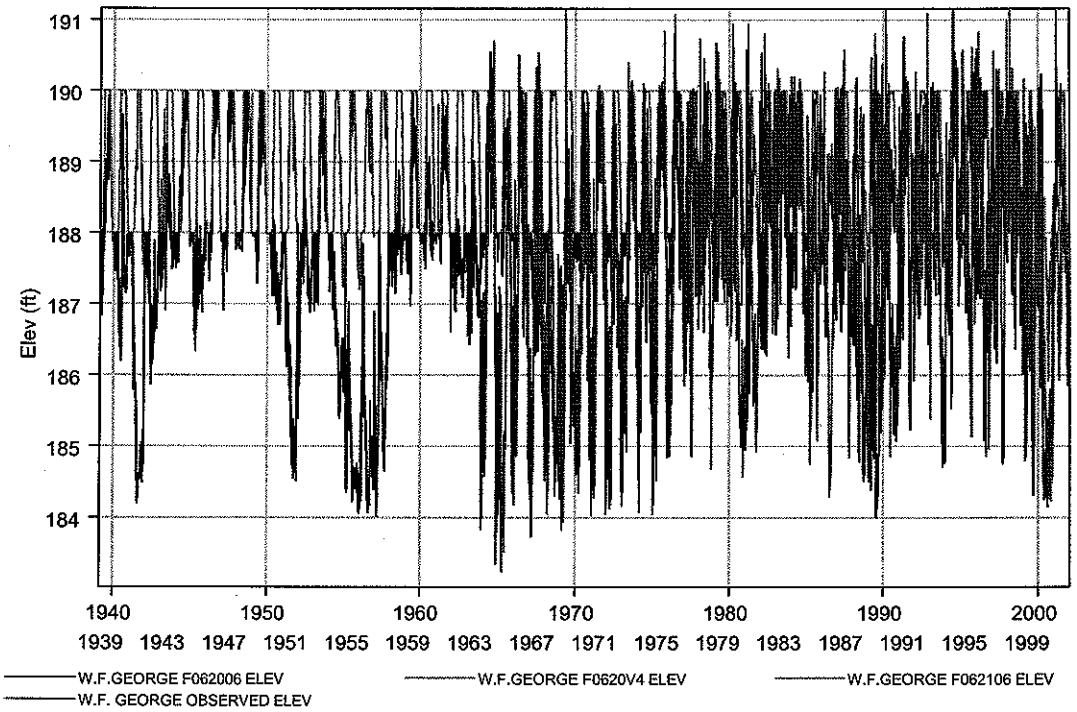


Fig. 7 Simulated and observed Walter F. George (Eufala) elevation

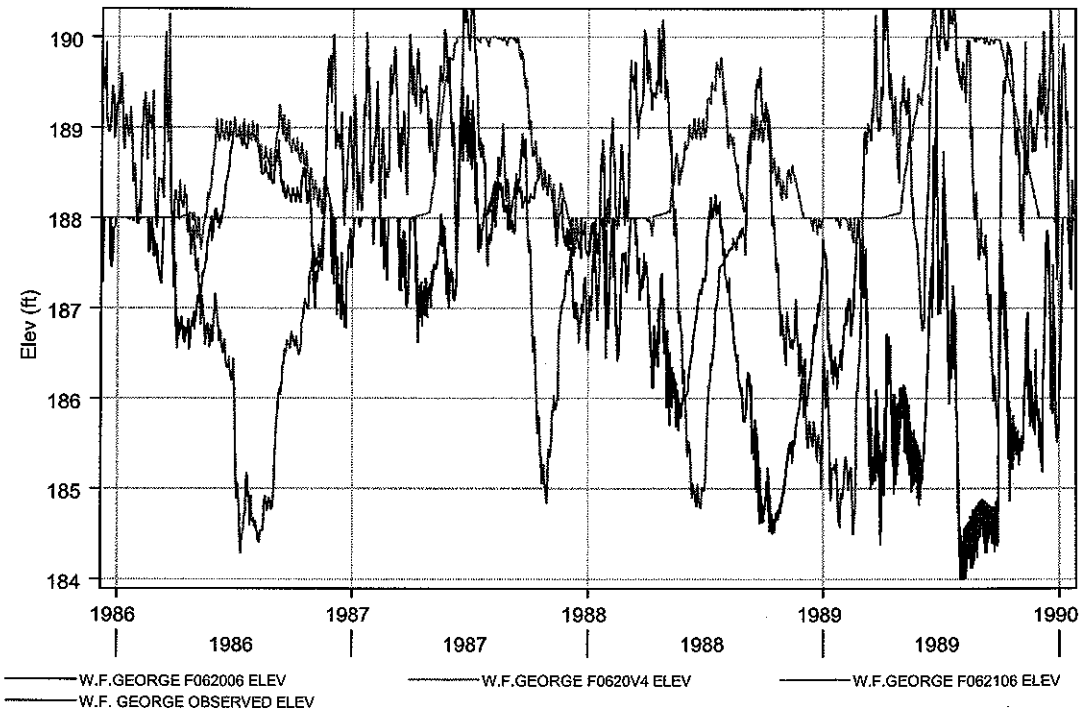


Fig. 8 Simulated (only F062006) and observed Walter F. George (Eufala) elevation (1980's)

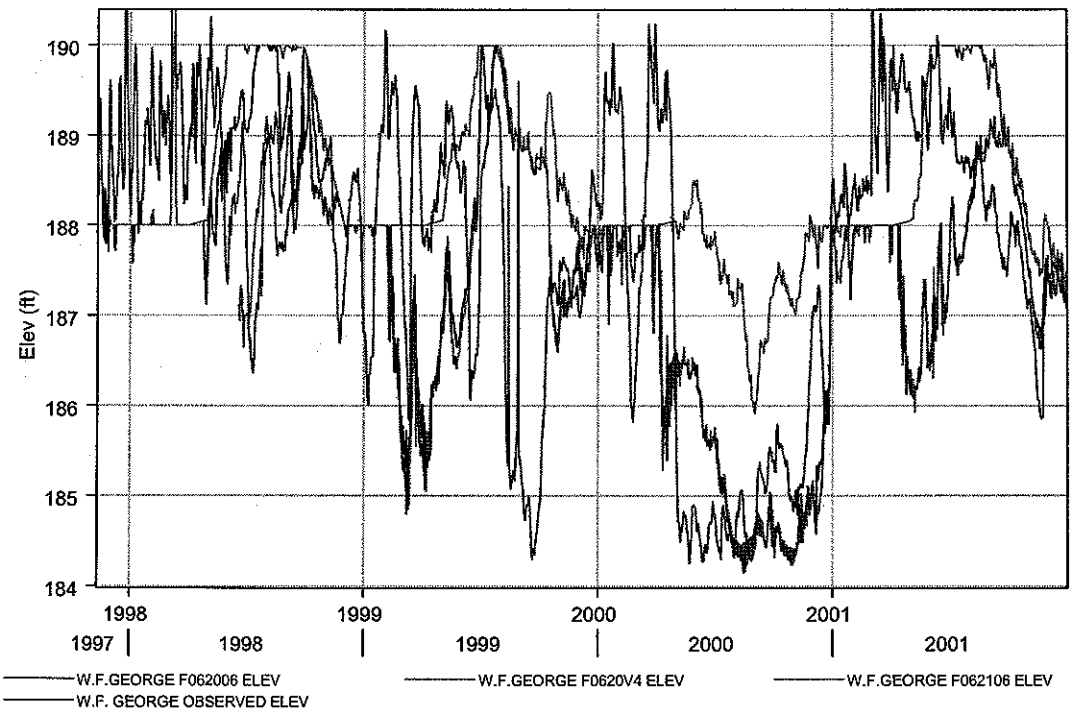


Fig. 9 Simulated and observed Walter F. George (Eufala) elevation (turn of century)