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IN THE DISTRICT COURT FOR THE FOURTH JUDICIAL DISTRICT OF THE

STATE OF IDAHO, IN AND FOR THE COUNTY OF ADA

BLUE LAKES TROUT FARM, INC., Petitioner/Plaintiff, vs. GARY SPACKMAN, in his official capacity as Director of the Idaho Department of Water Resources, and the IDAHO DEPARTMENT OF WATER RESOURCES, Respondents/Defendants.	CASE NO.: CV-WA-2010-19823 **AFFIDAVIT OF JOHN KORENY**

STATE OF WASHINGTON)
) ss.
County of King)

John Koreny, being first duly sworn upon his oath, deposes and says that:

1. I am a Senior Project Manager at HDR Engineering, Inc. My business address is 500 – 108th Avenue NE, Bellevue, Washington 98004. I make this Affidavit based upon my

personal knowledge and I am competent to testify to the matters contained herein. I have been involved in investigating the hydrology of the Eastern Snake Plain Aquifer and Upper Snake Basin for about 6 years and am a member of the Eastern Snake Plain Hydrologic Committee. I have 20 years of experience as a professional hydrologist. I received a M.S. degree in Civil and Environmental Engineering, a M.S. degree in Environmental Science (Hydrogeology) and a B.S. degree in Environmental Science (Water Chemistry). I am a licensed geologist in the State of Idaho and am certified as a Professional Hydrologist by the American Institute of Hydrology. My professional experience and credentials are summarized on the attached resume.

2. I have been retained by the Plaintiff, Blue Lakes Trout Farm, Inc. (BLTF), to perform a technical evaluation of the junior-priority ground water pumping injury determination by the Idaho Department of Water Resources (IDWR) for the BLTF delivery call.

3. My evaluations included, but were not limited to, a review of the use of the ESPAM ground water model and the use of a "trim line". Attached hereto as Exhibit 1 is a true and correct copy of the DRAFT report I prepared titled, "Technical Investigation for Blue Lakes Trout Farm Delivery Call" and dated October 13, 2010. This report is in draft form and may be altered, modified or amended, including, but not limited to, the addition of new or amended opinions, prior to any required disclosures in this or other matters currently pending before IDWR.

DATED this 13th day of October, 2010.

John Koreny

Sworn to and subscribed before me this 13 day of October, 2010.

Notary Public
State of Washington
GREGORY J GOODRICH
MY COMMISSION EXPIRES
August 08, 2013

Notary Public for [illegible]
Residing in [illegible]
My Commission Expires: 8/8/13

CERTIFICATE OF SERVICE

I hereby certify that on this 14th day of October, 2010, I served a true and correct copy of the foregoing **APPLICATION FOR PEREMPTORY WRIT OF MANDATE** by delivering it to the following individuals by the method indicated below, addressed as stated.

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c/o Victoria Wigle
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Boise, ID 83720-0098
victoria.wigle@idwr.idaho.gov

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S. Bryce Farris

HDR ONE COMPANY | *Many Solutions*™

John S. Koreny, PH, RG, PHG

Senior Hydrologist and Senior Project Manager

EDUCATION
M.S. Civil Engineering (Hydrology/Hydraulics), University of Washington

M.S. Hydrogeology (Environmental Science), Ohio State University

B.S. Environmental Science and Engineering, Rutgers University

REGISTRATION
Professional Surface and Ground Water Hydrologist: American Institute of Hydrology

State of Washington: Licensed Geologist, Engineering Geologist, Hydrogeologist

State of Oregon: Registered Geologist
State of Idaho: Registered Geologist

AFFILIATIONS
American Institute of Hydrology
American Water Works Association
American Water Resources Association
American Society of Civil Engineers

HDR TENURE
6 Years

INDUSTRY TENURE
20 Years

John has 20 years of consulting experience conducting water resource projects for water purveyors, municipalities, Federal and State government and the private sector. He has completed irrigation and municipal water supply studies, water rights investigations, hydroelectric relicensing projects, reservoir operations studies, basin-yield investigations, water quality studies, river hydraulics studies, sedimentation and geomorphology, watershed assessments and interconnected ground water and surface water studies. He has experience in surface water hydrology/hydraulics, ground water hydrology, water quality, irrigation, fluvial geomorphology and water rights. He is experienced in the use of hydrologic models for surface water and ground water projects. He has significant experience in water rights, water supply, hydrology and irrigation in the Western U.S. .

Snake River Basin and Eastern Snake River Plain Aquifer Hydrology Assessment, Idaho Surface Water Coalition, ID. Project Manager for a major water supply reliability and planning investigation of the Upper Snake Basin for seven irrigation districts and the Bureau of Reclamation. Investigated basin yield, reservoir operations, water rights, agricultural use, climate, snowpack and river flow to determine the long-term water supply for the Upper Snake Basin in Southeastern Idaho. Served as an expert witness in the SWC water delivery call. Worked cooperatively with the SWC, Reclamation and Idaho Power Co. to determine the long-term reliability of surface water for senior water rights holders in the basin.

Spokane River Hydroelectric Project Relicensing, Water Quality/Quantity Investigation, Avista Corporation, Spokane, WA. Project manager for the surface water quality and river/reservoir flow investigations for the Spokane River Hydroelectric Project. The project involves assessing the effects of hydroelectric facilities on Spokane River water quality over 80 miles of river involving five reservoirs, the Coeur d'Alene Lake and Lake Spokane. These studies are part of the efforts necessary to complete relicensing of the project. The project involves an extensive water quality assessment including development of a CE-QUAL-W2 model for the river from Lake Coeur d'Alene to Lake Spokane, assessment of various water quality scenarios and preparation of multiple water quality reports.

Minidoka Dam Hydropower Right Adjudication, Bureau of Reclamation and US Department of Justice, Washington D.C. Expert for Reclamation and DOJ for the adjudication of the Minidoka Dam hydropower right in the Snake River Basin Adjudication. Evaluated historic reservoir accounting and storage water delivered under the hydropower right priority dates and determined historic hydropower generation. Determined beneficial use of other competing water needs for the reservoir storage water. Evaluated administration and accounting of water under the right. Assisted with the development of technical information for litigation.

City of Billings Reservoir Storage Feasibility Study, Montana. Project manager for a planning and feasibility study for the development of a large multi-use storage reservoir for the City of Billings. Evaluated hydrology, water supply reliability, water supply demand, engineering geology, economics and preliminary design issues.

Lake Tapps Reservoir Water Right and Environmental Impact Study, Cascade Water Alliance, Washington. Completed technical studies, planning and document preparation for the issuance of a storage and diversion water right and for preparation of Environmental Impact documentation for a hydroelectric project being converted to a water supply project. Participated in hydrologic modeling, water quality analysis and fisheries studies for the project. Assisted with agency coordination with the Department of Ecology and CWA.

Endangered Species Act Consultation, Rogue River Irrigation Districts, Medford, OR. Senior hydrologist supporting the Rogue River Irrigation Districts as part of the ESA consultation between the Bureau of Reclamation, the U.S. Fish and Wildlife Service and NOAA-Fisheries. Evaluated the benefits of storage water for irrigation, instream flow and hydropower uses. Completed a professional review of the Biological Assessment including the habitat conditions, hydrologic analysis and water rights studies. Evaluated the complex water supply system in the Rogue Basin including six reservoirs, a hydroelectric facility and two river sub-basins. Developed a scientific analysis of hydrologic, geomorphic and habitat conditions as part of an independent submittal to the Services supporting preparation of a Biological Opinion.

Water Rights and Water Supply, Southeastern Idaho Energy, LLC, Idaho
Assisted SIE with obtaining water rights for a new power generation facility proposed to be constructed in Southeastern Idaho. Performed a water right valuation survey, identified potential water supply options, evaluated reliability of various options and developed a strategy to provide a long-term reliable supply for the proposed facility.

Umatilla River Basin Hydrologic and Water Rights Investigation, West Extension Irrigation District, Hermiston, OR. Project Manager for a detailed basin-wide hydrologic assessment in support of long-term water right and water supply planning for the West Extension Irrigation District. HDR assisted the District with long-term water right planning and analysis to evaluate causes for long-term streamflow decline in the Umatilla River basin and the associated potential impact to the district's water supply and water rights.

Walla Walla River Basin Hydrology, Water Right and HCP, Clarkston, WA
Completed hydrologic studies for a basin-wide water supply and streamflow analysis for a Habitat Conservation Plan for the basin. This involves assessing current and future water use, water rights and irrigation requirements, and available streamflow.

Mid-Snake Basin Water Use Study, Asotin PUD, Clarkston, WA Completed a water use study to identify irrigation and domestic use and ground water supply potential in the Mid-Snake Basin for Asotin PUD. Evaluated the 50-year expansion of irrigation in the basin and determined the increase in ground water and surface water irrigation.

A&B Irrigation District Wellfield Consulting, Rupert, ID. Evaluated the long-term sustainability of ground water pumping at A&B Irrigation District and the cause of decline in 180 wells pumping at 400 mgd. Provided recommendations for wellfield rehabilitation and expansion. Supervised installation of new wells. Provided expert witness services to defend the A&B water rights against interference by junior ground water rights. Completed a feasibility study to evaluate methods to provide additional water to district.

Ground Water Supply, City of Hoquiam, WA. Project manager for the development of a municipal ground water supply for the City of Hoquiam. Evaluating aquifer yield potential, ground water quality and water rights. Supervising installation of test wells, aquifer testing and development of a municipal ground water supply.

Portland Wellfield Expansion/ASR Project, Portland, OR. Project manager for a three-year water-supply investigation for the Portland wellfield. Completed aquifer testing analysis for 26 production wells. Designed new wells and supervised well rehabilitation. Performed an ASR pilot study. Supervised development of a deep basalt-aquifer test well. Evaluated water rights within the Portland Basin to assess the feasibility of expanding existing well fields. Developed a model to simulate the hydrogeology of the wellfield and to design wellfield expansion and ASR operations.

McAlister Springs Wellfield Mitigation Project, City of Olympia, WA. Completed a water supply study to evaluate options to mitigate for the depletion effects of pumping of City of Olympia McAlister Springs wellfield. Project involved analysis of impacts, evaluation of alternatives and consultations with Ecology on mitigation methods.

Wellfield Development, American Electric Power Co., Ohio.
Assisted a power generation facility with planning and development of a wellfield capable of supplying 12,000 gpm for cooling water. Evaluating hydrogeologic sustainability of well field development in the unconfined aquifer along the Ohio River for options including Ranney collector wells and conventional production wells.

Woodland Creek Source Exchange and Aquifer Recharge, City of Lacey, WA.
Completed a source exchange and aquifer recharge project for the City of Lacey. Completed analysis and permitting studies to determine methods to infiltrate water to the shallow aquifer in the vicinity of Woodland Creek to increase stream flow and to offset flow depletion from pumping of City of Lacey wells.

Washington State Patrol Wellfield Development, North Bend, WA. Completed well rehabilitation and ground water development for the Washington State Patrol Facility. Analyzed the existing water supply to determine wellfield rehabilitation options. Evaluated aquifer characteristics and wellfield development potential and provided recommendations for expansion of water supply.

Birch Bay Water and Sewer District, Blaine, WA. Hydrogeologist for the development of municipal ground water wellfield for the Birch Bay Water and Sewer District. Installed and tested test and production wells. Assisted with water rights. Participated in ASR feasibility study.

Port Orchard/McCormick Woods Wellfield and Water Rights Study, Department of Ecology, Bremerton, WA. Senior hydrologist for review of wellfield development and water rights applications on behalf of the Washington State Department of Ecology. Reviewing regional hydrogeologic assessments and evaluating validity of water rights applications. Provided expert review of the groundwater flow model developed for the project.

Columbia South Shore Wellfield, Aquifer Storage and Recovery Pilot Project, Portland, OR. Provided technical support for an ASR pilot project in the Columbia South Shore Wellfield. Performed numerical model evaluations of the proposed ASR system layout including evaluation and simulation of surface water injection/recovery cycles, reviewed geochemical analysis and assisted with revisions to well design for the wellfield. Evaluated potential contaminant migration issues associated with the proposed ASR injection/ recovery cycles.

Samish River Watershed Assessment, Skagit Council of Governments, Skagit County, WA. Completed a groundwater/surface water study for the Samish River basin. Collected and synthesized data on groundwater/stream flow interactions, water rights

and conjunctive use for regional groundwater management and watershed planning. Completing an assessment of groundwater and surface water interactions for the Skagit River basin. Developed a complex groundwater model over an area of approximately 300 square miles including over ten public-supply wellfield for regional purveyors. The model passed review by a Technical Advisory Group and the Washington Department of Ecology. The groundwater flow model was used along with a continuous surface-water flow model (HSPF) to evaluate impacts of groundwater use on low river flow.

PUBLICATIONS

Lee, W., J.F. Clark, M. Abbaszadegan, P. Fox, R. Hodon, J. Koreny, G. Carpenter, 2008. Selection and Testing of Tracers for Measuring Travel Times in Groundwater Aquifers Augmented with Treated Wastewater Effluent. Water Reuse Foundation Technical Report, Water Reuse Foundation, Alexandria, Virginia.

Koreny, J.S. and others, 2006. Water management in a small, coastal, non-regulated river basin. *Journal of Hydrologic Science and Technology*. Vol 21, No. 4.

Koreny, J.S. and T.T. Fisk. 2001. Utilizing induced recharge for regional aquifer management. *Journal of the American Water Resources Association*, Vol 37, No. 2.

Koreny, J.S. and T.T. Fisk, 2000. Hydraulic continuity of the Portland Basin deep aquifer system. *Environmental and Engineering Geology*, 6(3): 279-292.

Koreny, J.S., W.J. Mitsch, E.S. Bair and X. Wu, 1999. Regional and local hydrology of a created riparian wetland system. *Wetlands*, 19(1): 182-193.

EXPERT WITNESS EXPERIENCE

US Department of Justice, 2009-2010. Expert Report for Minidoka Dam Hydropower Right Adjudication, Snake River Basin Adjudication Court, Denver, Colorado.

City of Caldwell, 2009-2010. Expert Report for City of Caldwell vs. Pioneer Irrigation District, Idaho District Court, Caldwell, Idaho.

Clear Springs Foods, 2008-2009. Expert Report and Testimony for Snake River Farms Mitigation Plan, Idaho Department of Water Resources Water Right Contested Case and Administrative Hearing and Idaho District Court, Boise, Idaho.

Idaho Trout Company, 2006-2009, Expert Report and Testimony for Blue Lakes Trout Company Water Right Delivery Call, Idaho Department of Water Resources Administrative Hearing and Idaho District Court, Boise, Idaho.

A&B Irrigation District, 2004-2009, Expert Report and Testimony, A&B Unit B Water Delivery Call and Water Right Delivery Call, Idaho Department of Water Resources Administrative Hearing and Idaho District Court, Boise, Idaho.

Surface Water Coalition, 2005-2009, Expert Report and Testimony, Water Delivery Call for Surface Water Coalition, Idaho Department of Water Resources Administrative Hearing and Idaho District Court, Boise, Idaho.

West Extension Irrigation District, 2004-2007, Technical Support for Legal Counsel, West Extension Irrigation District Water Supply Reliability Analysis, Umatilla, Oregon.

Rogue River Water Users Council, 2004, Technical Support for Legal Counsel, Section 10

ESA Consultation, Rogue Basin Project, Talent, Oregon.

Medford Irrigation District, 2004, Technical Support for Legal Counsel, Reservoir Impact Study, Medford, Oregon.

Miles Sand and Gravel Co. vs. Friends of Nisqually River, 2004, Expert Report and Testimony, Mine Permit Renewal, Pierce County Hearing Examiner, Tacoma, Washington.

Jack McCann Co., 2002. Testimony, Hydrologic Assessment of Rock Creek Basin for Proposed Residential Development, King County Green River Basin Council, Auburn, Washington.

Norpac Foods, 2001. Expert Report and Direct Testimony, Gray-Tucker Aggregate Mine Permit Contested Case, Oregon.

Pyramid Lake Pauite Tribe, 1998. Expert Report and Direct Testimony, Litigation on Federal Authorization and Dept. of Interior Permit for the Olinghouse Gold Mine, Federal Court, Truckee River Valley, Nevada.

EXHIBIT 1

Draft
Technical Investigation Report

Blue Lakes Trout Farm
Delivery Call

October 13, 2010

by
John S. Koreny, RG, PH
HDR, Inc.

HDR

412 E. Parkcenter Blvd.
Suite 100
Boise, ID US 83706

Table of Contents

1.0 Introduction

This draft report summarizes technical investigations related to the use of the ESPAM model at Blue Lakes Spring.

2.0 Prediction of Impacts at the Individual Blue Lakes Spring Instead of Devils Washbowl to Buhl Reach

In previous Orders pertaining to this matter, Director of IDWR calculated the impacts from junior-priority ground water pumping to Blue Lakes Trout Farm using the Eastern Snake River Plain Aquifer Model (ESPAM). The Director used the ESPAM model to evaluate the impacts to BLTF from ground water rights junior to the BLTF 1971 water right. The impacts from junior ground water pumping were estimated at the the Devils Washbowl to Buhl reach instead of directly at the Blue Lakes Spring which is the source of water to BLTF. The procedure used assumed that 20 percent of the impacts to the Devils Washbowl to Buhl reach occur at Blue Lakes Spring. This method was based on IDWR's assumption that Blue Lakes Spring flow is about 20 percent of the flow in the Devils Washbowl to Buhl reach.

There are three reasons why this method is inappropriate.

1. ***Ground water pumping impacts are not uniform across the DW-B reach.*** The IDWR method assumes that the impacts from ground water pumping occur uniformly to the various springs in the Devils Washbowl to Buhl reach occur uniformly. It is not appropriate to assume that all springs are impacted in the same manner across the reach. The Devils Washbowl to Buhl reach is over *24 miles* long. The ground water irrigated areas and the springs simulated in the ESPAM model in the Devils Washbowl to Buhl reach are shown on **Figures 1**. The spatial distribution of ground water pumping within and near the Devils Washbowl to Buhl reach varies greatly and the impacts from ground water pumping will be different at individual springs within the reach. The IDWR procedure estimates impacts by priority date and the impacts vary dependent on priority date and location of pumping. Blue Lakes Springs is the most-upgradient major spring in the reach and is likely to be more greatly impacted than other springs lower in the reach. It is very inaccurate and over-simplistic to assume all the springs in the reach will respond proportionally as the flow rate in the reach.

2. ***Even if the method was appropriate, the flow at the DW-B reach is not known precisely.*** Even if the method were appropriate, the calculation of flow at the Devils Washbowl to Buhl reach is based on a USGS report of spring flow measurements from the 1940s to the 1960s in Covington and Weaver (1989). The current estimate of flow at Devils Washbowl to Buhl is based on old measurements and is not known very accurately for current conditions. Therefore the 20 percent estimate is not very accurate.

3. ***The ESPAM model can be used to predict the flow at Blue Lakes Spring individually.*** The ESPAM model was specifically constructed with a spring flow boundary cell at Blue Lakes Spring. The model calibration at Blue Lakes Spring is very good. There are no other springs contributing water to BLTF and the flow path from Blue Lakes Spring to BLTF is well known. Therefore, the ESPAM model can be used to predict the impacts individually to Blue Lakes Spring and BLTF without the inaccuracy associated with the assumption that 20 percent of the impacts in the Devils Washbowl to Buhl reach occurs at Blue Lakes Spring.

We used the individual Blue Lakes Spring model spring cell to predict the impacts from junior-priority ground water pumping directly at Blue Lakes Spring. This method does not have to make the 20 percent assumption for impacts at the spring from the DW-B reach because the spring flow impacts are computed directly at the ESPAM model drain cell representing Blue Lakes Spring. In our opinion, it is much more accurate and appropriate to evaluate the impacts to Blue Lakes Spring using this method.

2.1 Method and Results

Curtailment runs were simulated using the ESPAM Version 1.1 model to evaluate impacts of groundwater pumping junior to the BLTF 1971 and 1973 priority dates at the individual model cell representing Blue Lakes Spring. The results of the analysis indicate that the prediction of impacts at the individual Blue Lakes Spring are about 1.7 times higher than the prediction of impacts at the DW-B reach. For example, the impacts predicted on the Devils Washbowl to Buhl spring reach are 19 cfs and are 33 cfs at the individual Blue Lakes Spring. The results are shown on **Table 1**.

2.2 Test to Verify Impact Assessment Method Using Individual Blue Lakes Spring Drain Cell

The method described above to evaluate impacts to Blue Lakes Spring at individual drain cells instead of the Devils Washbowl to Buhl reach has been discussed in the Eastern Snake Hydrologic Modeling Committee (ESHMC) meetings and with Dr. Allan Wylie of IDWR. Dr. Wylie is IDWR's expert regarding use of the ESPAM model. Dr. Wylie was questioned to determine his opinion of the appropriateness of using the individual spring drain cell instead of evaluating impacts at the reach scale by Mr. Dan Steenson on November 13, 2009. Mr. Wylie indicated that the model could be used to predict the impacts to flow directly at Blue Lakes Spring, provided that the other springs in the DW-B reach were directly included in the model calibration. The following are the relevant portions of the transcript.

> *Q. Would you agree that if your concern about the lack of data for some of the other springs in the reach can be resolved and the calibrations that need to be done and haven't been done do get done, that it would be preferable to use the model to predict the impact of ground water pumping on Blue Lakes Springs, as opposed to this 20 percent allocation method that's been adopted?*
>
> *A. So if I could be convinced that enough of the flux was accounted for in that reach?*
>
> *Q. Yes.*
>
> *A. Then -- then the model could be used to directly determine the flow at Blue Lakes.*
>
> Source: Deposition of Allan Wylie, November 13, 2009, Pg. 125, line 16-25, Pg. 126, line 1-4.

In this question and answer session Dr. Wylie indicates that he prefers that all of the model springs in the Devils Washbowl to Buhl reach be calibrated so that we understand that the simulated amount going to each spring is correct. Once this is done, than the model could be used to predict the impacts at the specific spring.

Additional analysis was completed to evaluate the issues raised by Dr. Wylie. This included recalibrating the model to include the individual springs in the DW-B reach and then evaluating the impacts from ground water pumping at the DW-B reach and at the individual model drain cell representing Blue Lakes Spring. The results of the calibration runs and the impact assessment

were compared to the original model results to see the effect of including all of the springs in the DW-B reach. The results are presented below.

2.2.1 Model Recalibration Including Niagara Springs and Other Springs in DW-B Reach

A series of model runs were completed by Dr. Willem Schreuder of Principia Mathematica in Denver, Colorado to address the concerns raised by Dr. Wylie and to incorporate flow data for all of the springs in the DW-B reach into the transient model calibration. Dr. Schreuder serves on the ESHMC committee along with Mr. Koreny and Dr. Wylie and is a recognized expert in model calibration.

Transient calibration flow data is already in the ESPAM Version 1.1 model for the following springs located in the DW-B reach: Devils Washbowl, Devils Corral, Blue Lakes, and Crystal Springs. The only major spring not already included in the model calibration was Niagara Spring. Flow data was compiled for Niagara Spring from Cindy Yenter, the WD 130 Watermaster and the fish hatcheries run by Idaho Trout Co. and the Idaho Department of Fish and Game (see **Figure 2**). This flow data was submitted to Dr. Wylie and the Eastern Snake Hydrologic Modeling Committee (ESHMC) and discussed in the March 2010 ESHMC meeting. The Niagara Spring flow data is now being used by Dr. Wylie for the next version of the ESPAM model. There are a few additional springs simulated in the model that have very low spring flow values (1-2 cfs) including Niagara Springs and the unnamed springs upstream of Devils Washbowl, unnamed springs between Devils Washbowl and Blue Lakes, and unnamed springs between Blue Lakes and Crystal. Calibration targets were added for these springs by estimating flow from the Covington and Weaver (1989) report.

The specific data included in Dr. Schreuder's model recalibration included historical discharge measurements for Niagara Spring from 1997 to 2002. The weighting assigned to these flow observations was selected to weigh Niagara Spring equal to other flow targets. In addition, flow observations were set for the unnamed springs upstream of Devils Washbowl, unnamed springs between Devils Washbowl and Blue Lakes, and unnamed springs between Blue Lakes and Crystal. The target flows for these unnamed springs were set as the flows in Covington and Weaver. The observations were set as the average flow for these sub-reaches and weighted to match other average flow targets.

Initially, the recalibration procedure exactly followed the procedures initially used in the calibration of ESPAM 1.1, that is to first calculate the Jacobian, then perform a singular value decomposition (SVD) of the Jacobian, and then finally to optimize the super-parameters. This procedure was followed verbatim, except that the observations were expanded to include Niagara Springs and the three unnamed spring sub-reaches, and that a newer version of the optimization program (PEST 12) was used. This procedure did not match the observations at the unnamed springs well, so instead of using the SVD procedure, a calibration was performed using the same set of observations but the full set of parameters. This calibration provided a good match between model predictions and observations for all springs in the Devil's Washbowl to Buhl reach, as well as other targets. Calibration graphs are included in **Appendix A** for individual springs located in the DW-B reach, in addition to Niagara Springs and unnamed spring sub-reaches.

2.2.2 Evaluation of Impacts at Blue Lakes Spring Using Recalibration Model with Niagara Springs and Other Springs in the DW-B Reach

Using the recalibrated model with refinement to Niagara Springs and other smaller springs in the Devils Washbowl to Buhl reach as suggested by Dr. Wylie, a curtailment run was conducted to evaluate the impacts of ground water pumping junior to the BLTF 1971 and 1973 priority dates

The flow was computed at the individual Blue Lakes Spring using the re-calibrated model. A time-series response at Devils Washbowl to Buhl reach and Blue Lakes Spring for 1971 and 1973 priority dates is presented in **Figure 3**.

A summary of results are included in **Table 1**, and show that the Blue Lakes Spring flow is about the same using the re-calibrated model as compared to the original model (about 3% difference). The predicted impacts of flow at Blue Lakes Spring with 1971 and 1973 priorities are 34 cfs and 27 cfs, respectively. With the re-calibrated model, the prediction of impacts at the individual Blue Lakes Spring are significantly higher than the prediction of impacts at the Devils Washbowl to Buhl spring reach. For example, using a 1971 priority date the impacts predicted on the Devils Washbowl to Buhl spring reach are 23 cfs and increase to 34 cfs at Blue Lakes Spring.

Table 1 **Comparison of prediction of impacts at individual Blue Lakes Spring model cell as compared to Devils Washbowl to Buhl reach using ESPAM version 1.1.**

Scenario	Devils Washbowl to Buhl Reach Gain (cfs)	Director's Order (20%)	Blue Lakes Springs Individual Drain
November 17, 1971 Priority	96.28	19.26	33.08
December 28, 1973 Priority	73.52	14.70	25.83

Table 2 **Increase in flow from simulated curtailment of ground water pumping at 1971 and 1973 priority dates with original and newly calibrated ESPAM 1.1 model.**

Scenario	Devils Washbowl to Buhl Reach Gain (cfs)	Director's Order (20%)	Blue Lakes Springs Individual Drain
November 17, 1971 Priority			
Full curtailment (original ESPAM 1.1)	96.28	19.26	33.08
Full curtailment (ESPAM 1.1 calibrated to include Niagara Springs and smaller springs in Devils Washbowl to Buhl reach)	118.29	23.66	34.14
Difference	*+22.01*	*+4.4*	*+1.06*
December 28, 1973 Priority			
Full curtailment	73.52	14.70	25.83
Full curtailment (ESPAM 1.1 calibrated to include Niagara Springs and smaller springs in Devils Washbowl to Buhl reach)	90.54	18.11	26.74
Difference	*+17.02*	*+3.41*	*+0.91*

Spring Grid

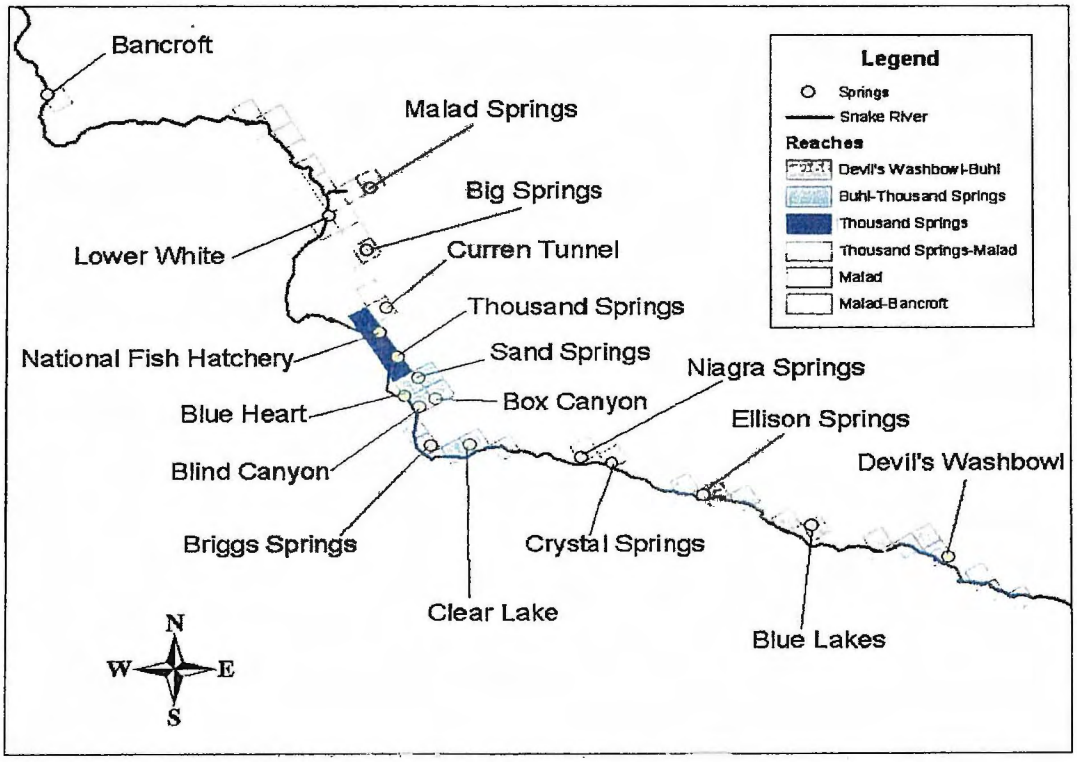


Figure 1 Springs in ESPAM model in Devils Washbowl to Buhl reach.

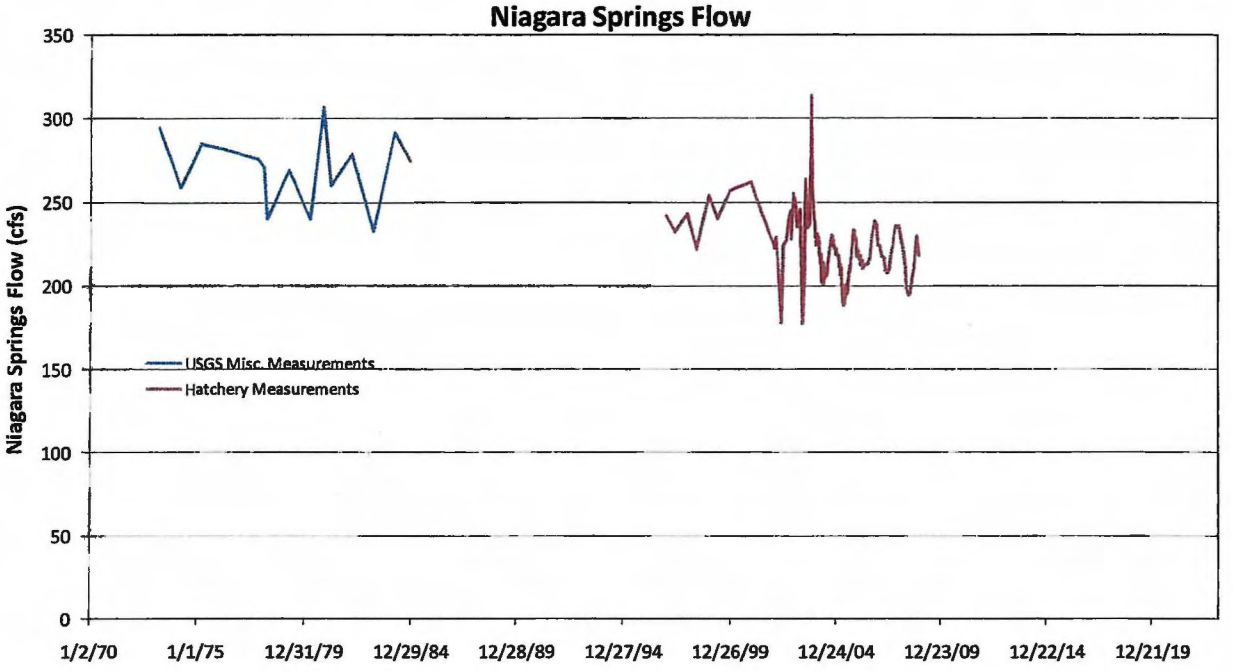


Figure 2 **Niagara Springs flow measurements. (Source: Cindy Yenter, WD 130 Watermaster, Idaho Trout Co., Idaho Fish and Game, Niagara Springs Hatchery)**

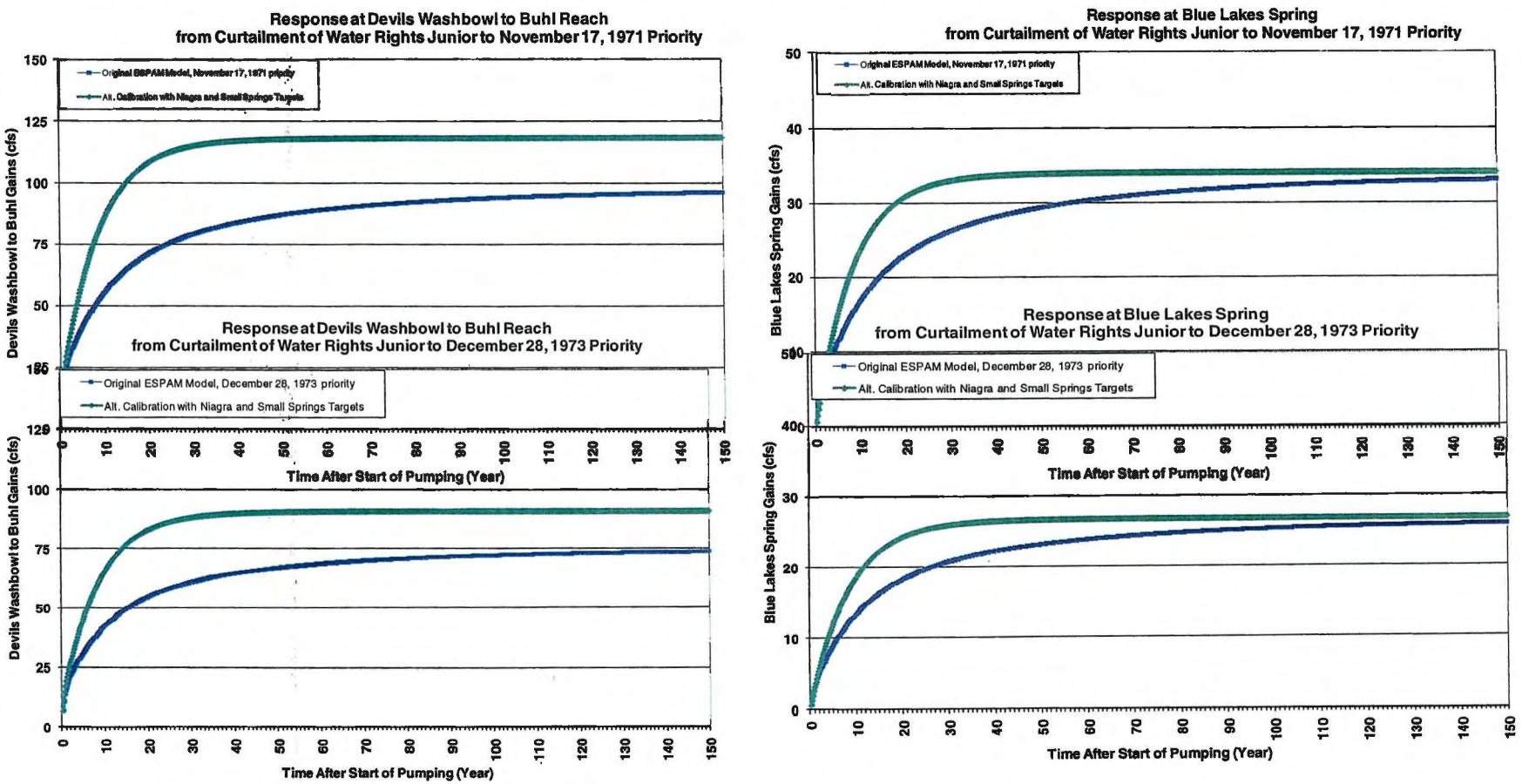
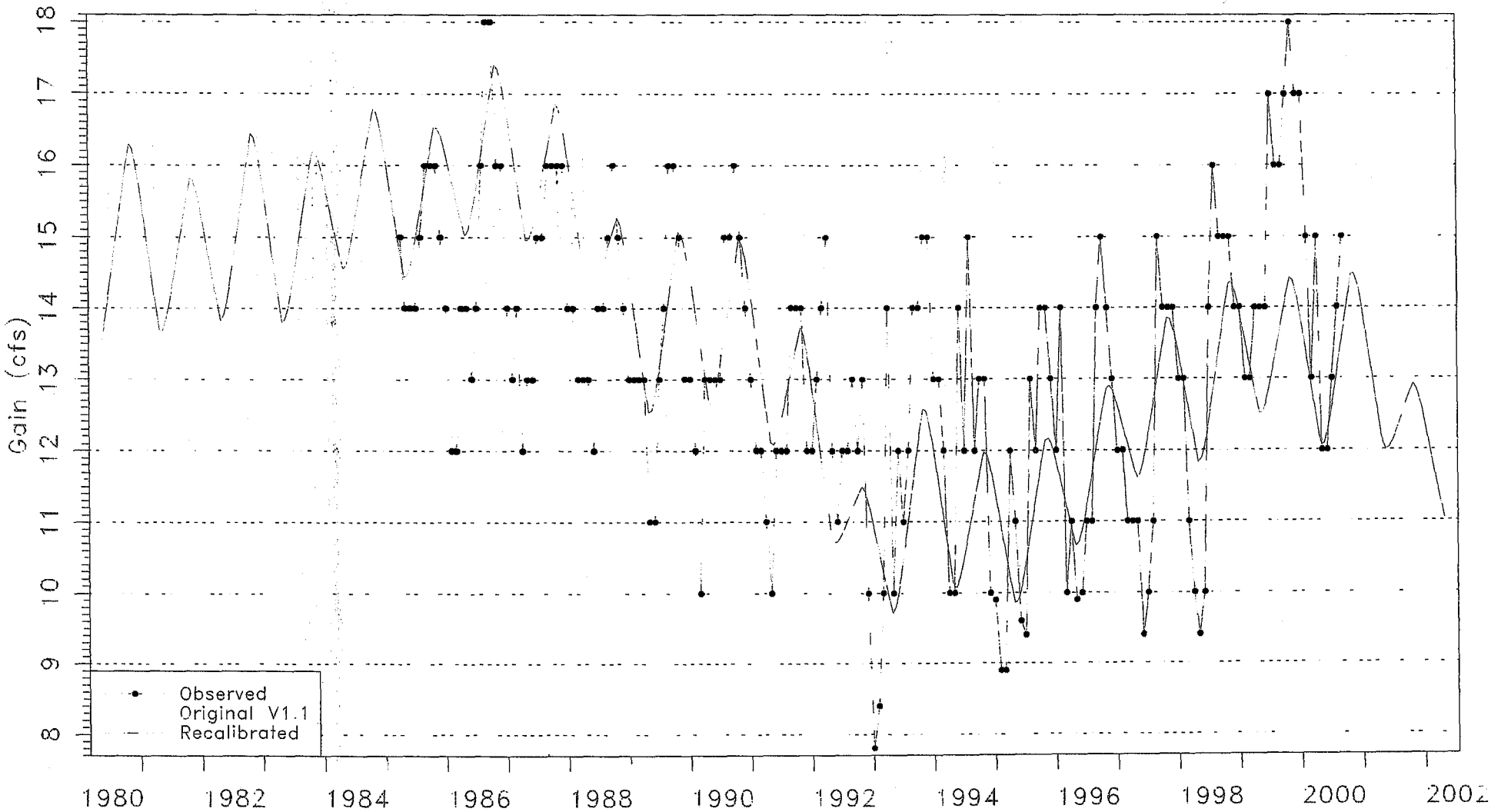


Figure 3 Increased Flow Predicted at the Blue Lakes Spring drain and DW-B reach Subject to 1971 and 1973 priority date.

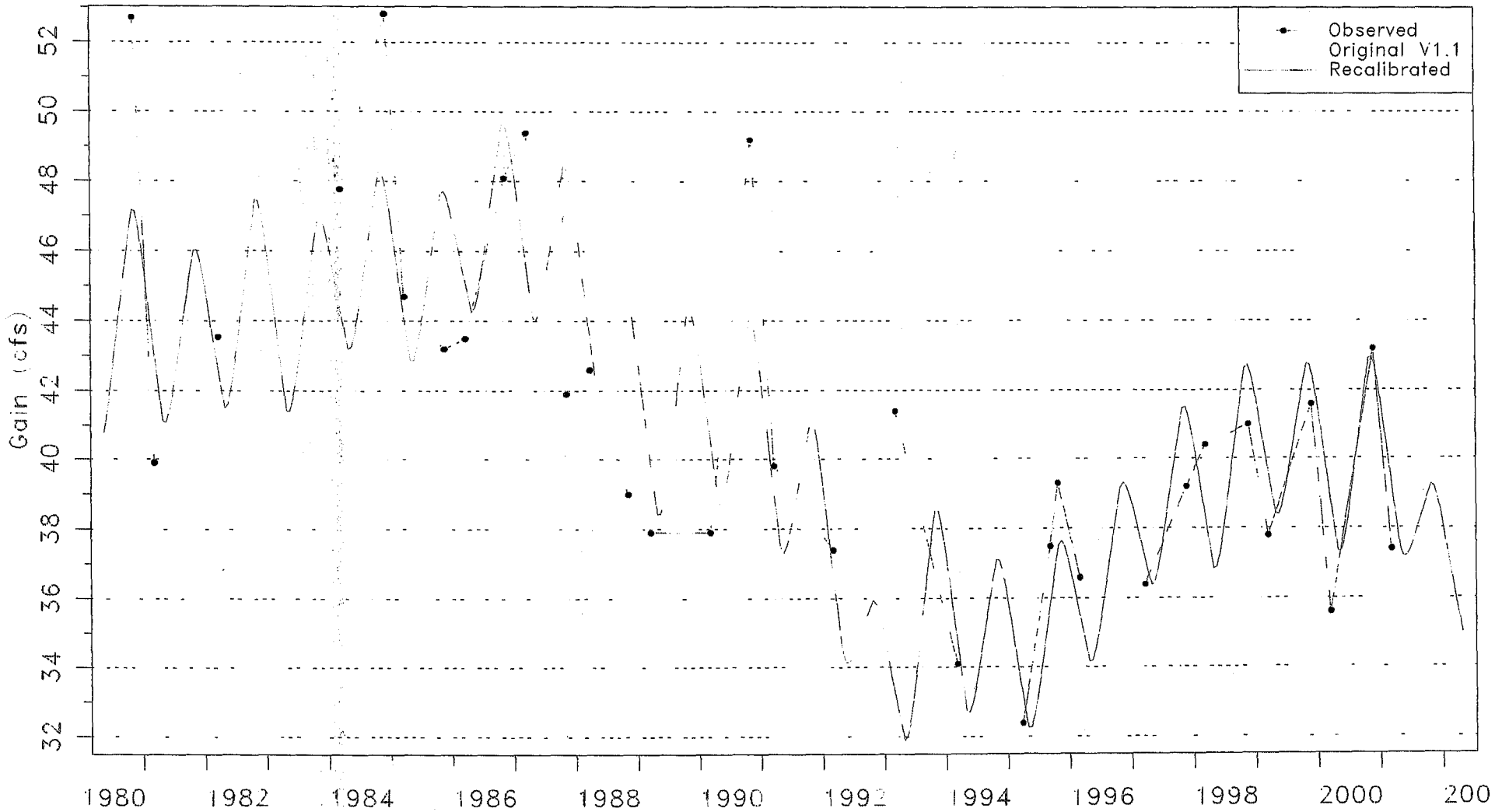
Appendix A

Calibration Graphs Comparing ESPAM Version 1.1 and Recalibrated Model for Individual Springs Located in the Devils Washbowl to Buhl Reach

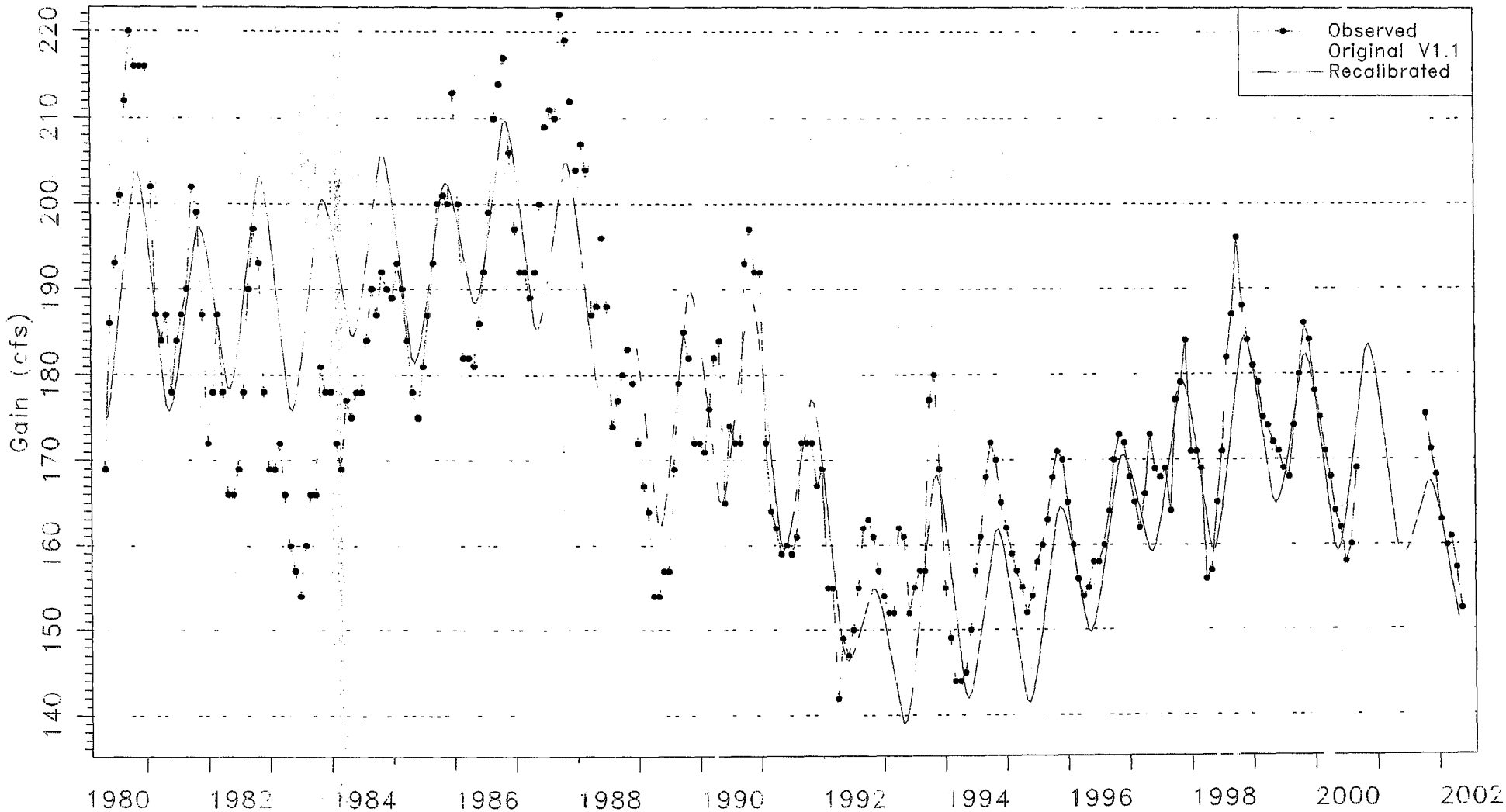
Devils Washbowl



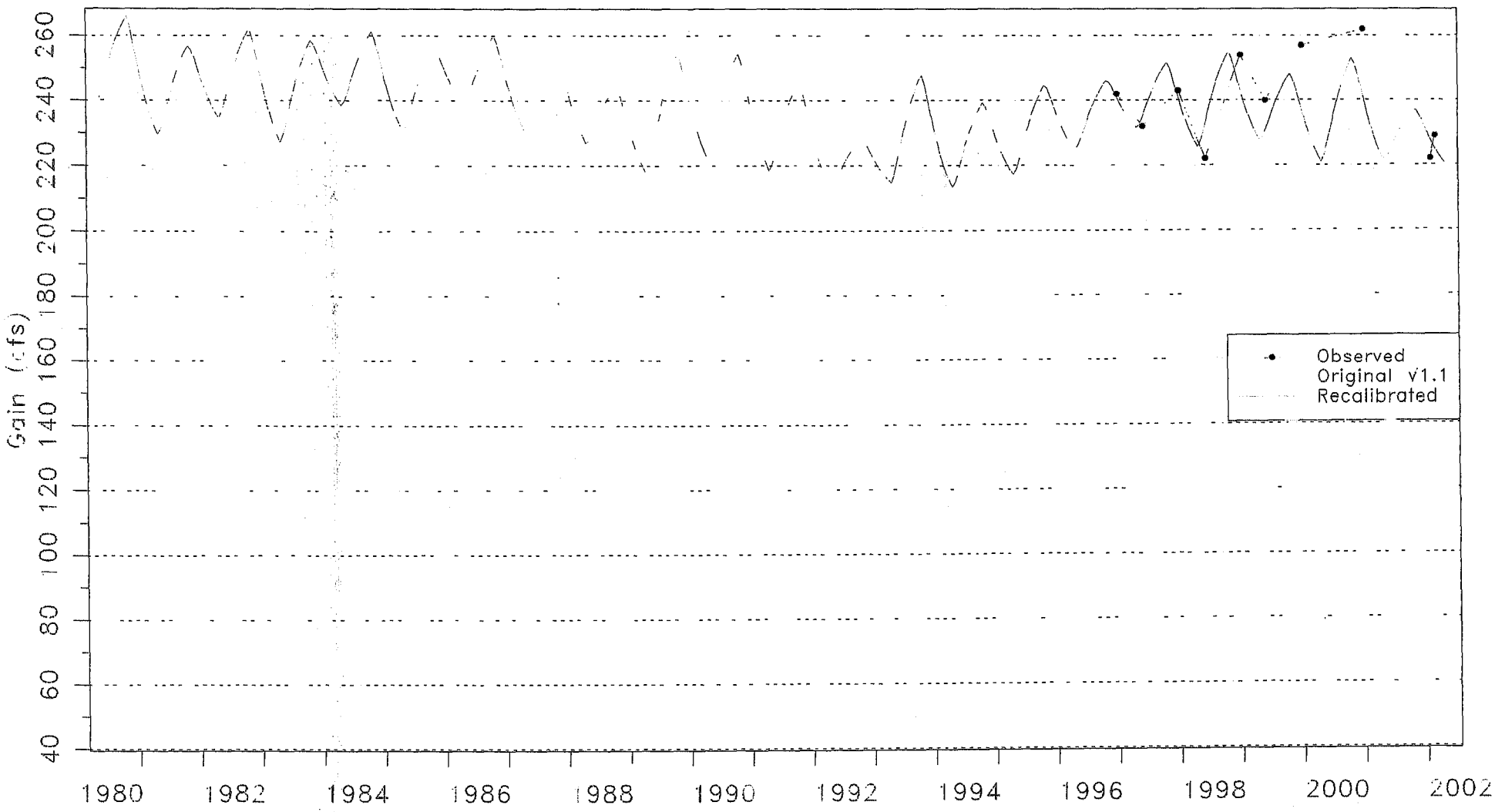
Devils Coral



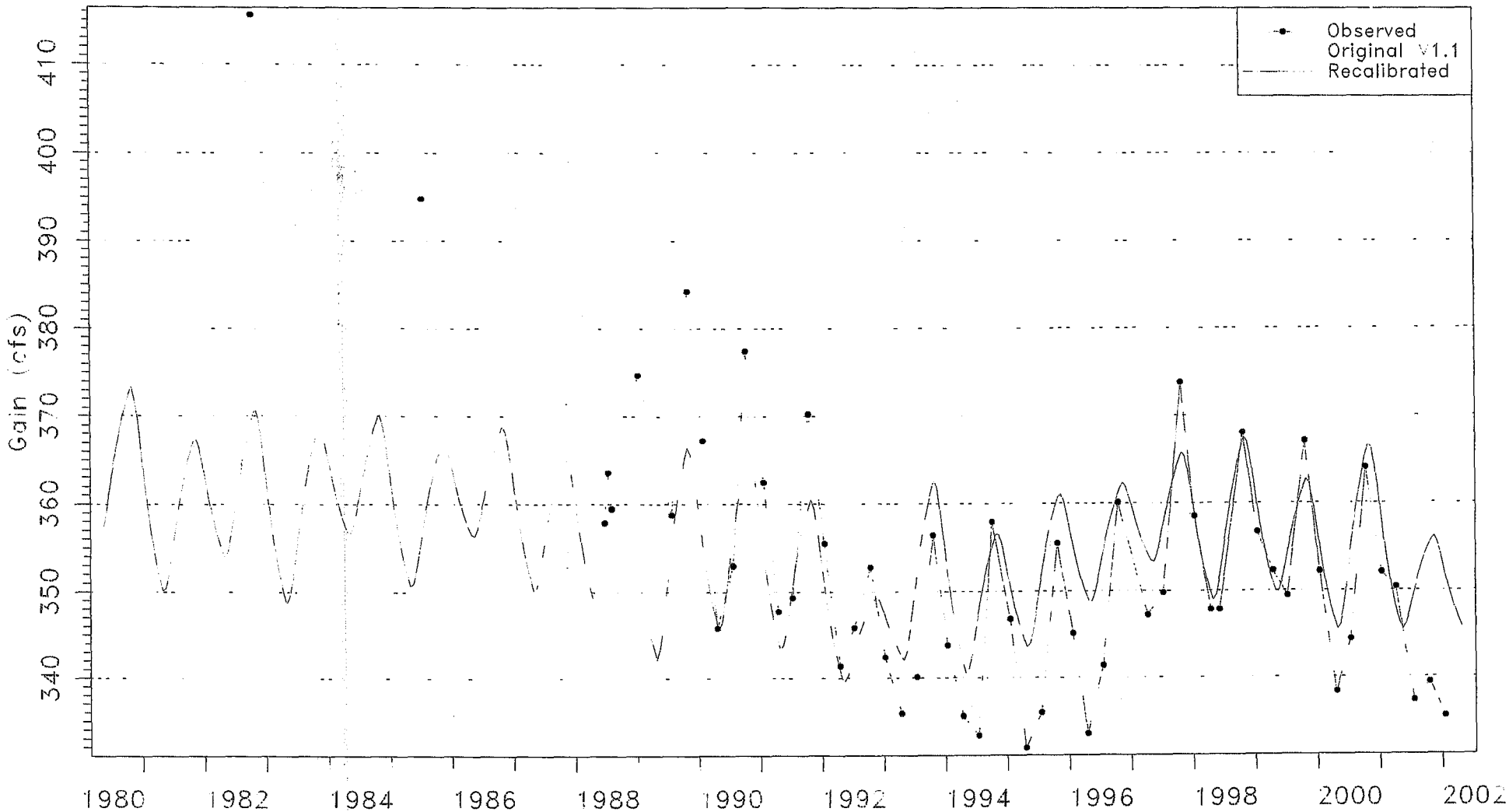
Blue Lakes

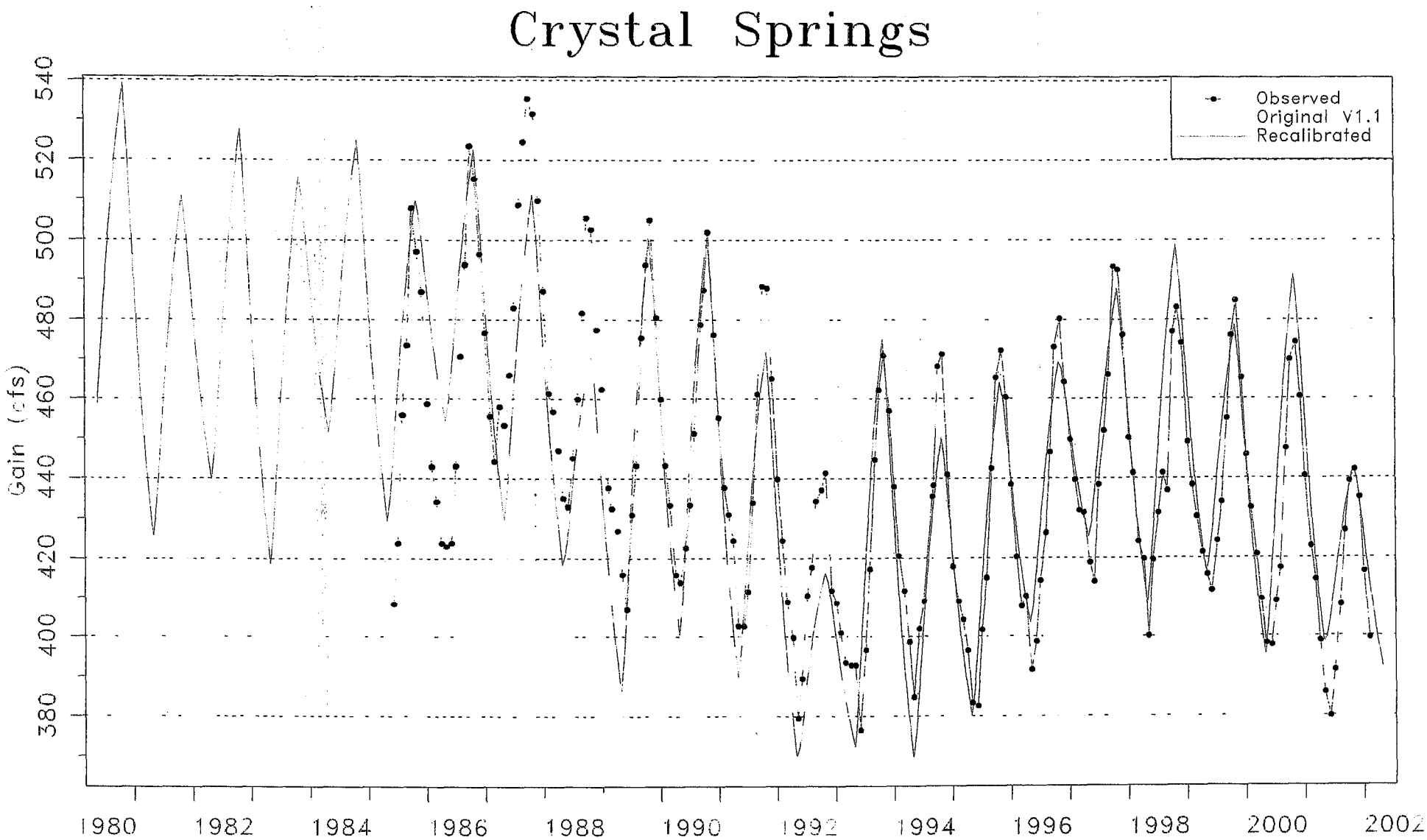

Observed
Original V1.1
Recalibrated
Gain (cfs)
140
150
160
170
180
190
200
210
220
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002

Niagra Springs

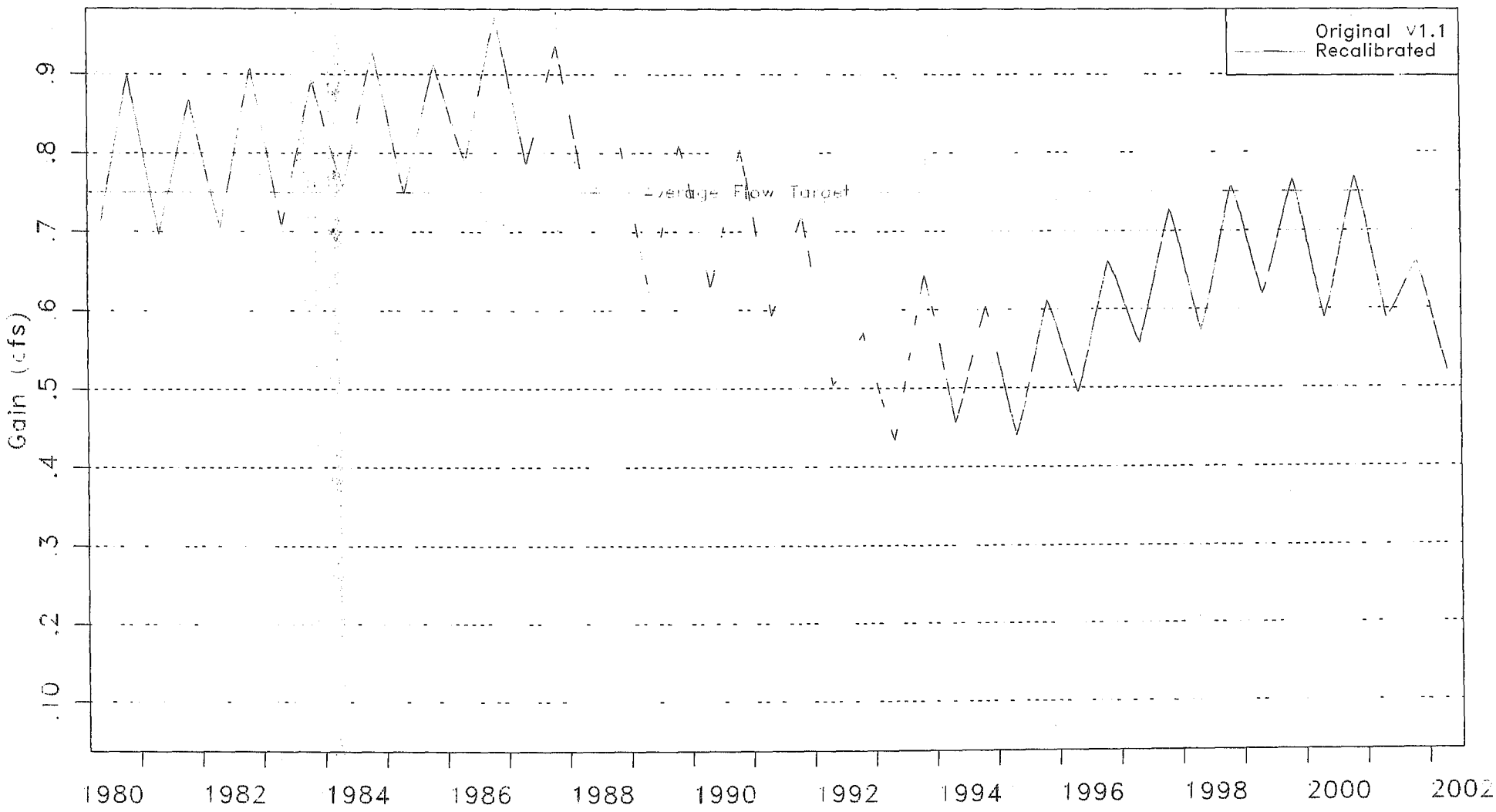


Clear Lakes

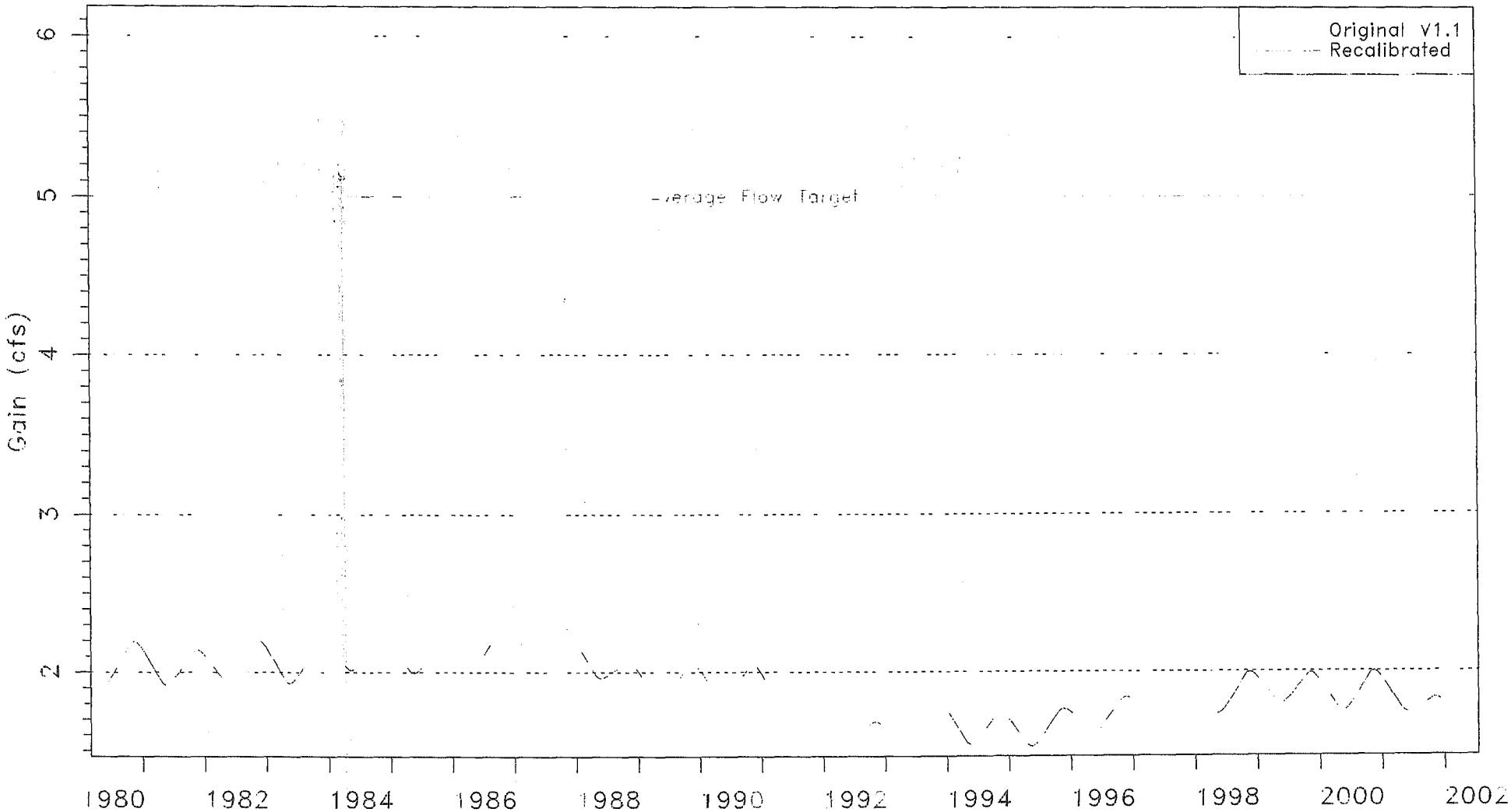

Observed
Original V1.1
Recalibrated
Gain (cfs)
340
350
360
370
380
390
400
410
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


Crystal Springs
Observed
Original V1.1
Recalibrated
Gain (cfs)
380
400
420
440
460
480
500
520
540
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002

Unnamed: Above Devil's Washbowl



Unnamed: Devil's Washbowl–Blue Lakes



Unnamed: Blue Lakes-Crystal