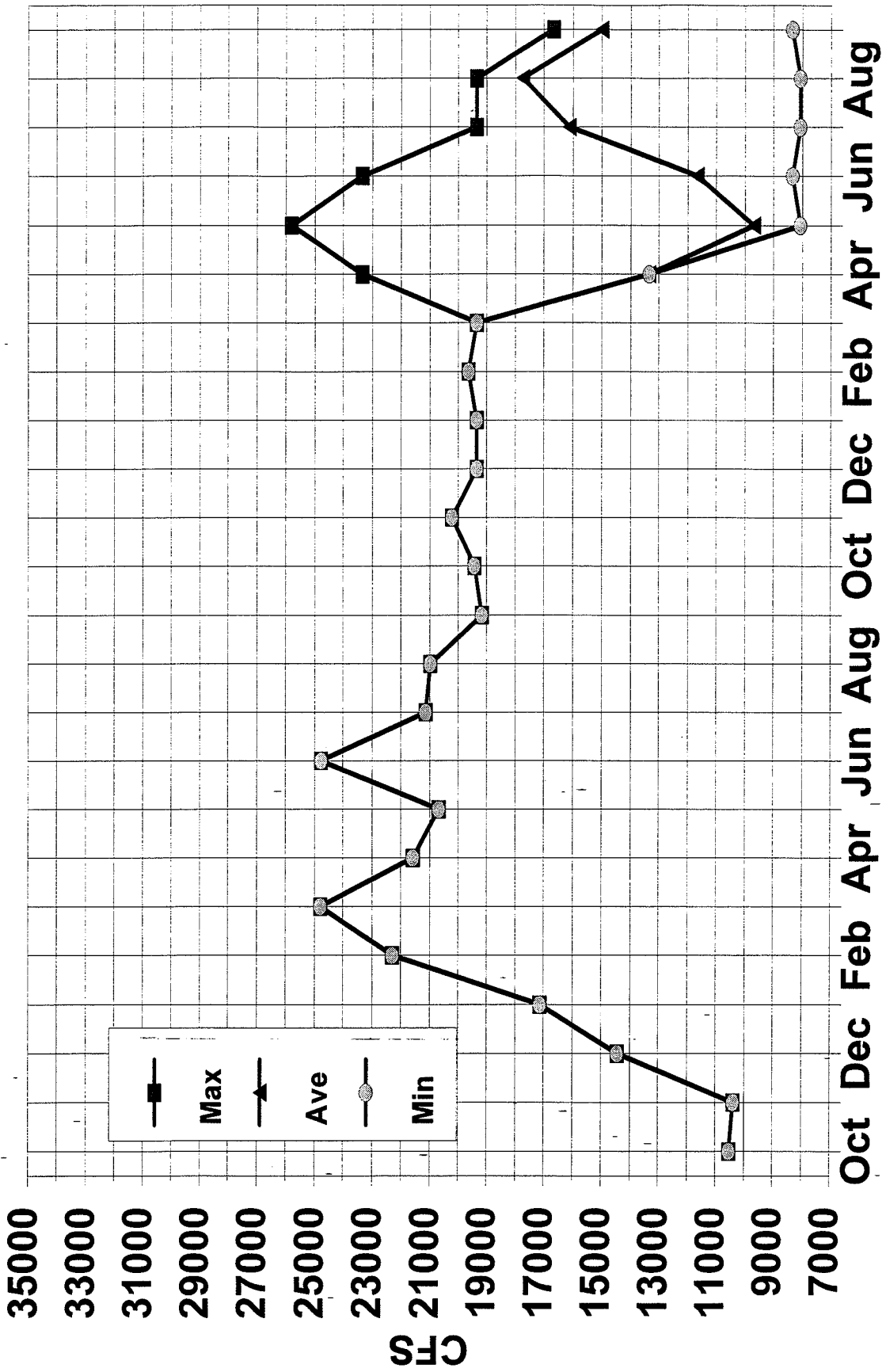


Glen Canyon Releases

1997 - 1998



on Mar 9 15:37:11 1998

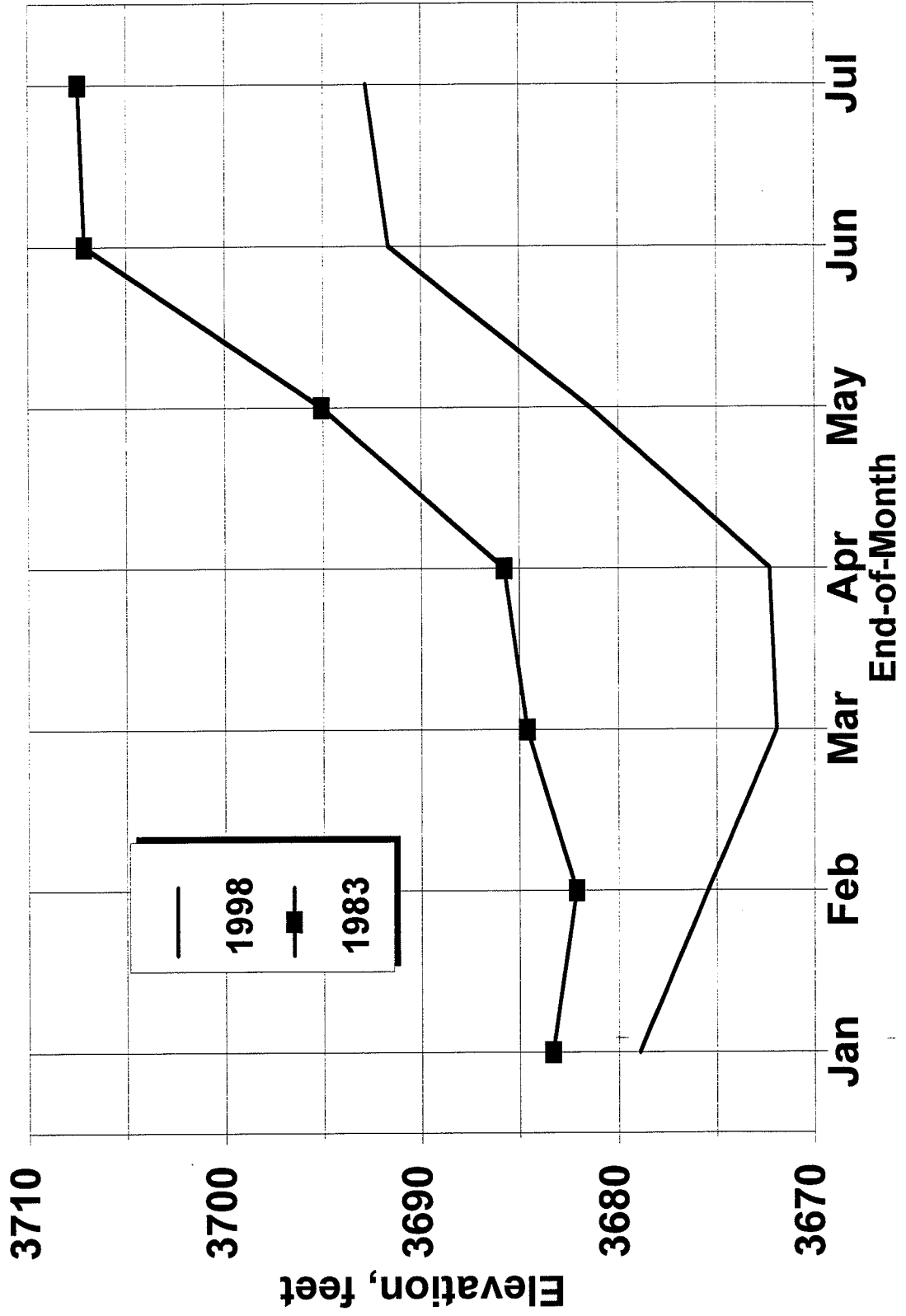
OPERATION PLAN FOR COLORADO RIVER SYSTEM RESERVOIRS

Glen Canyon - Lake Powell

Month Year	Unreg Inflow		Regulated Inflow		Evap Losses		Power Release		Bypass Release		Total Release		Bank Reservoir Storage		Reservoir Elevation		Live Storage		Lee Flow		
	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft	Feet	1000	AC-Ft	1000	AC-Ft	1000	AC-Ft
* MAR 1997	1049		1063		23		1537		0		1537		17983		3663.22	18918		1555			
H APR 1997	1267		1336		34		1295		0		1295		17800		3664.64	19108		1332			
I MAY 1997	3544		3089		47		1282		0		1282		17580		3678.84	21090		1506			
S JUN 1997	4977		4119		71		1486		0		1486		17848		3694.08	23384					
T JUL 1997	1533		1527		76		1311		0		1311		18078		3693.50	23293					
O AUG 1997	1063		918		86		1251		0		1251		18060		3690.91	22892					
R SEP 1997	1038		1037		82		1142		0		1142		17964		3690.32	22801					
R WY 1997	16832		16002		587		13785		0		13784										
I																					
C OCT 1997	1035		1087		48		1205		0		1205		18044		3688.70	22554					
A NOV 1997	674		841		41		1213		0		1213		18062		3685.85	22123					
L DEC 1997	567		814		36		1254		0		1254		18114		3682.30	21595					
* JAN 1998	469		668		25		1199		0		1199		18051		3678.93	21103					
* FEB 1998	433		574		27		1091		0		1091		17980		3675.64	20630					
MAR 1998	600		668		33		1200		0		1200		17938		3671.93	20107					
APR 1998	965		893		37		800		0		800		17942		3672.30	20159					
MAY 1998	2140		2065		51		600		0		600		18047		3681.44	21468					
JUN 1998	2840		2425		62		700		0		700		18170		3691.66	23008					
JUL 1998	1455		1264		72		1000		0		1000		18184		3692.81	23186					
AUG 1998	590		629		74		1100		0		1100		18144		3689.54	22682					
SEP 1998	473		563		63		900		0		900		18115		3687.10	22311					
WY 1998	12241		12491		569		12262		0		12262										
OCT 1998	548		617		56		750		0		750		18100		3685.93	22136					
NOV 1998	524		622		47		750		0		750		18088		3684.85	21974					
DEC 1998	428		579		39		1000		0		1000		18053		3681.98	21548					
JAN 1999	383		528		29		1100		0		1100		18009		3678.16	20992					
FEB 1999	414		527		27		900		0		900		17979		3675.58	20622					
MAR 1999	605		695		33		800		0		800		17969		3674.68	20494					
APR 1999	1007		949		38		700		0		700		17985		3676.06	20690					
MAY 1999	2239		1926		52		700		0		700		18072		3683.53	21777					
JUN 1999	2968		2438		62		800		0		800		18188		3693.13	23235					
JUL 1999	1521		1314		73		1200		0		1200		18192		3693.38	23274					
AUG 1999	608		669		74		1200		0		1200		18147		3689.75	22714					
SEP 1999	480		609		63		1000		0		1000		18113		3686.98	22293					
WY 1999	11725		11473		593		10900		0		10900										
OCT 1999	548		631		56		800		0		800		18096		3685.59	22085					
NOV 1999	524		650		47		800		0		800		18082		3684.38	21903					
DEC 1999	428		598		39		1000		0		1000		18049		3681.62	21495					
JAN 2000	383		538		29		1100		0		1100		18005		3677.86	20948					
FEB 2000	429		549		27		900		0		900		17977		3675.41	20598					

Lake Powell Elevations

1998 vs 1983



Probability of Spills from Glen Canyon Dam

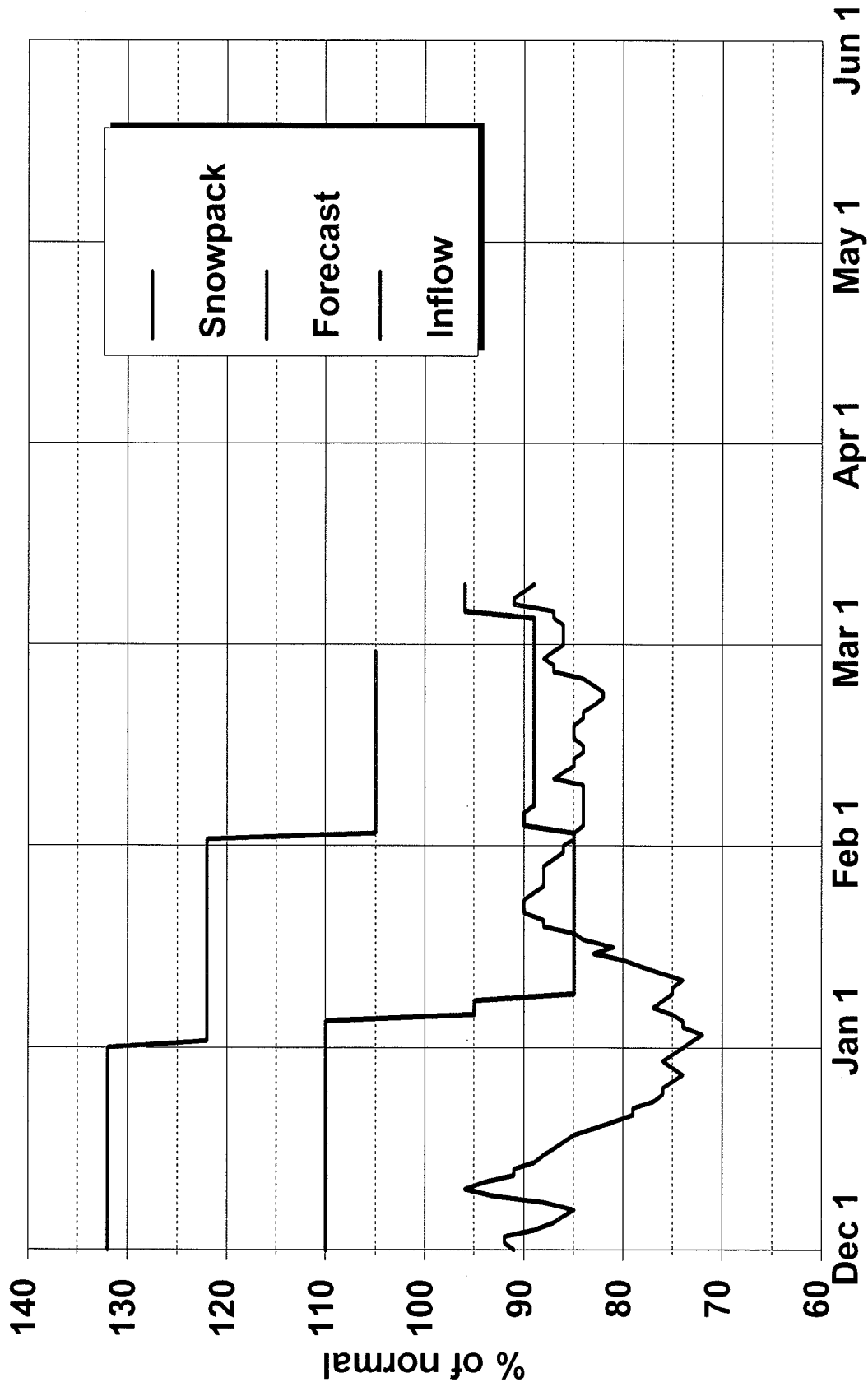
Release volumes in MAF

	March 1 forecast error probabilities	Error volumes MAF
Volume of scheduled releases Mar - Jul	4.3	0.0
Volume of releases at 20,000 cfs, Mar - Jul	6.0	1.7
Volume of releases at 20,000 cfs Mar - Jul, but with one month at 25,000 cfs	6.3	2.0
Volume of releases at 20,000 cfs Mar - Apr and 25,000 cfs, May - Jul	6.9	2.6
Volume of releases at powerplant capacity, 20,000 cfs Mar - Apr and 25,000 cfs May - Jul	8.0	3.7
	5 %	3.3
	10 %	2.4
	20 %	1.5

Difference between
this and scheduled
powerplant releases

1998 Lake Powell Operation

Forecast, Snowpack and Inflow



From: Randall Peterson
To: ibr4dm40.4gcm.SMANKILLER, ibr4dm40.4gcm.TMELIS
Date: 3/16/98 12:58pm
Subject: Draft outline for my presentations at the TWG mtg

Outline of TWG presentation

Current Hydrologic Conditions

- a - Basin snow map
- b - March forecast
- c - 1998 GCD release graph
- d - 24 - month study table
- e - 1998 vs 1983 elevation graph
- f - Risk of spill table
- g - Forecast, snowpack, inflow graph

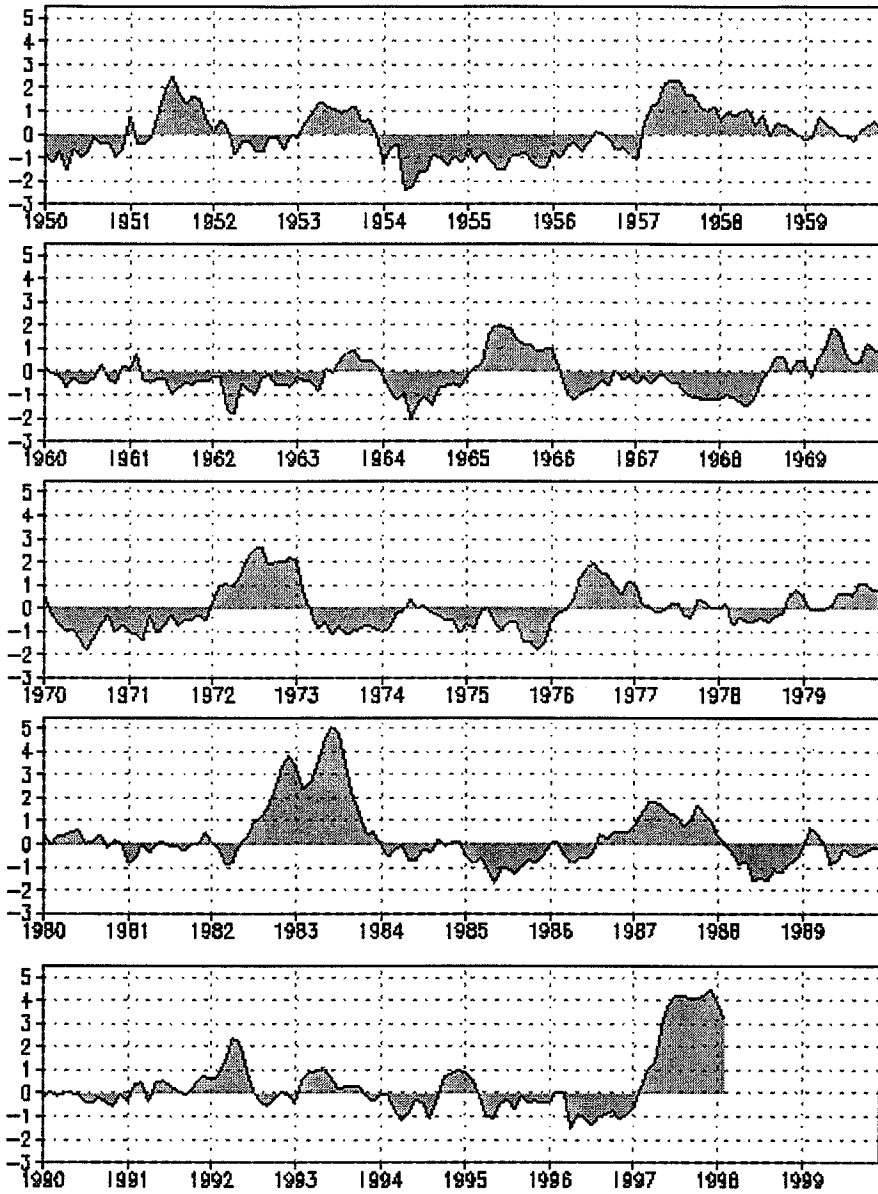
ENSO correlations

- www color graphs (discussion of ENSO data)
- Current NWS analysis
 - El Nino/La Nina segregations
 - Bob Adams' precip study (h) (i)
 - Bob Adams' graphs (j)

→ Regression plots

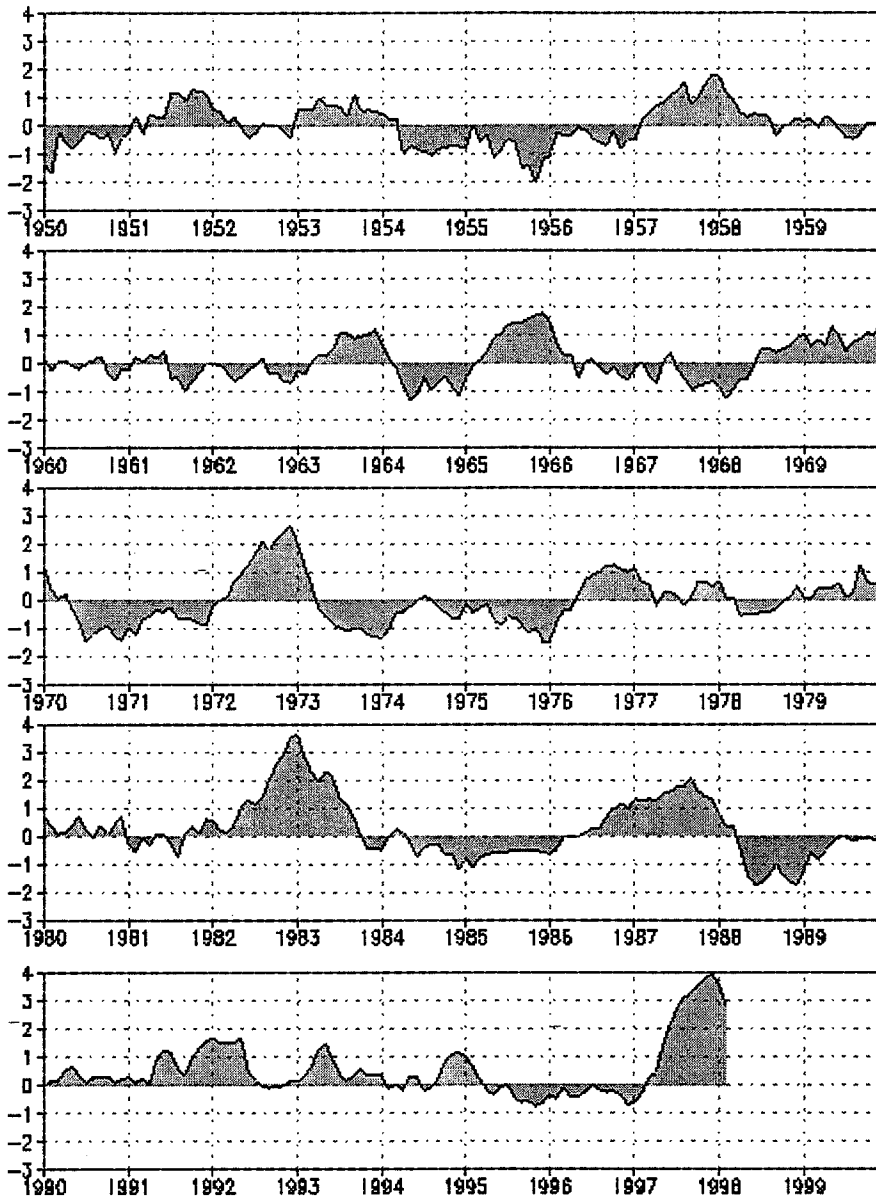
- (k) - May - Jun precip vs. May - Jul SOI
- (l) - Apr - Jun precip vs. Dec - Feb SOI
- same plot for just ENSO years

SST Anomalies NINO 1+2



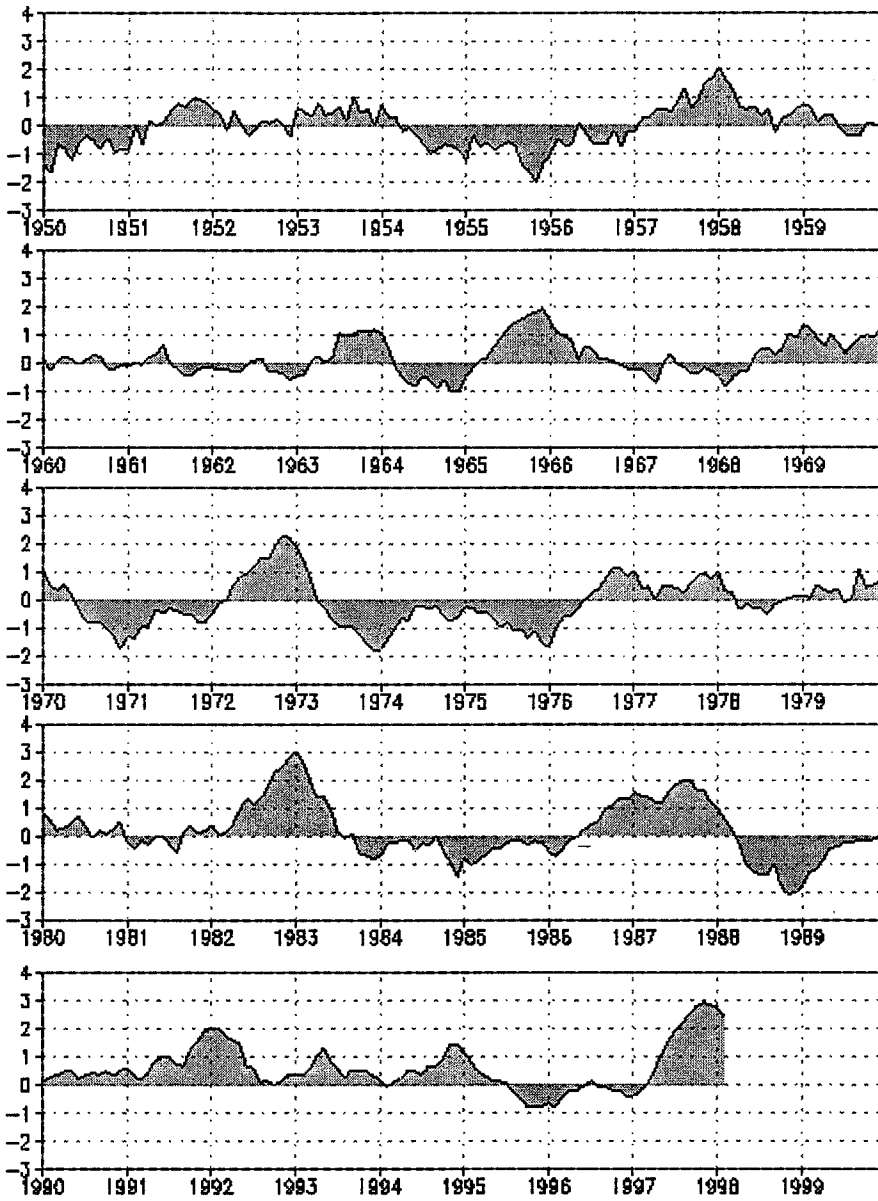
CLIMATE PREDICTION CENTER/NCEP

SST Anomalies NINO 3



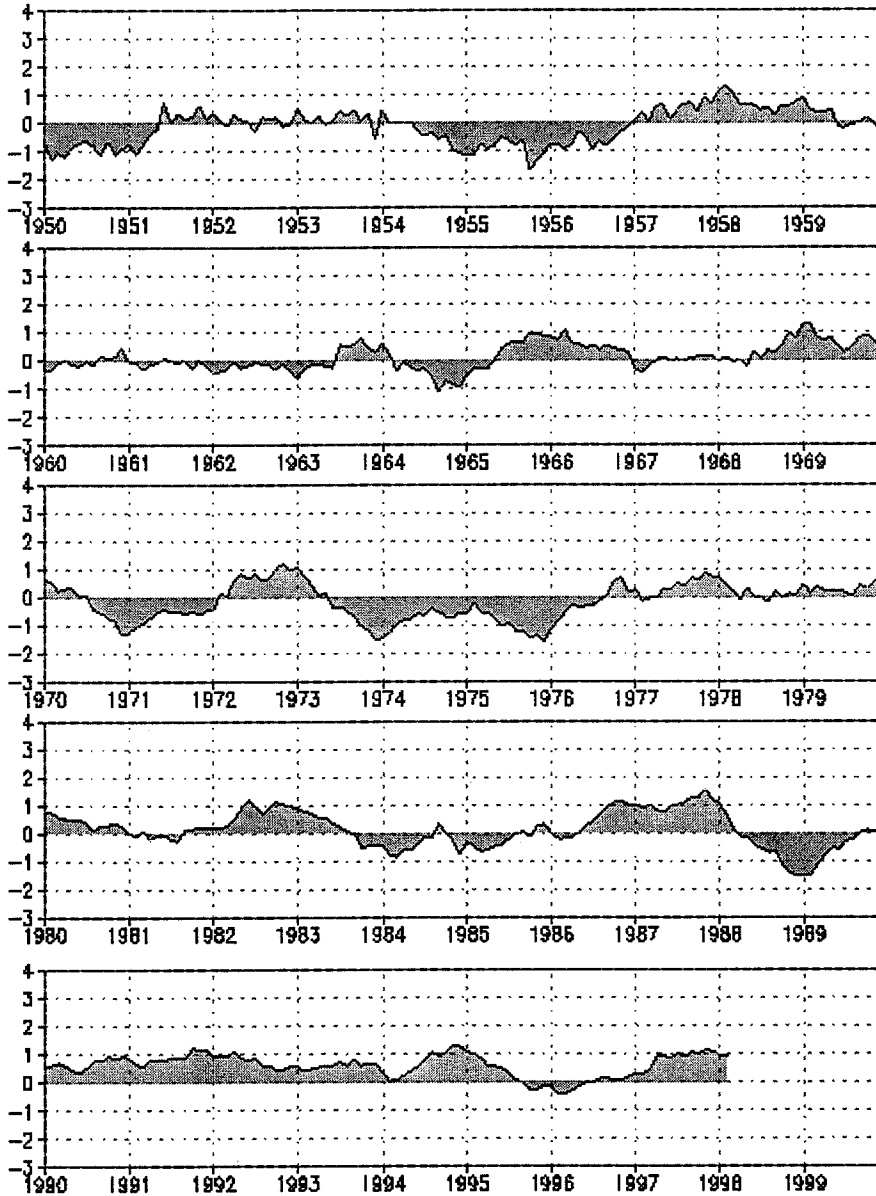
CLIMATE PREDICTION CENTER/NCEP

SST Anomalies NINO 3.4



CLIMATE PREDICTION CENTER/NCEP

SST Anomalies NINO 4



CLIMATE PREDICTION CENTER/NCEP

From: "Robert T. Adams" <bob@elk.cbrfc.gov>
To: ibr4dm10.ibr4smtp("rpeterson@uc.usbr.gov")
Date: 3/4/98 7:54am
Subject: ?

YEARS FROM 1902 TO 1997 - EL NINO/LA NINA EVENTS

EL NINO (WARM)	LA NINA (COLD)	LAKE POWELL INFLOW: W=ABOVE (>110%) A=AVERAGE (90<A>110%) D=BELOW (<90%)
		YEAR INFLOW
1902	1904	1965 W
1905	1909	1966 D
1911	1910	1967 D
1914	1915	1968 A
1918	1917	1969 A
1923	1924	1970 A
1925	1928	1971 A
1930	1938	1972 D
1932	1950	1973 W
1939	1955	1974 D
1941	1956	1975 W
1951	1964	1976 D
1953	1970	1977 D
1957	1971	1978 W
1965	1973	1979 W
1969	1975	1980 W
1972	1988	1981 D
1976	1995	1982 A
1982		1983 W
1986		1984 W
1991		1985 W
1994		1986 W
1997		1987 A
		1988 D
		1989 D
		1990 D
		1991 D
		1992 D
		1993 W
		1994 D
		1995 W
		1996 A
		1997 W
		1998 ?

From: "Robert T. Adams" <bob@elk.cbrfc.gov>
 To: ibr4dm10.ibr4smtp("rpeterson@uc.usbr.gov")
 Date: 3/3/98 12:53pm
 Subject: ?

COLORADO PRECIP STUDY - PERIOD OF RECORD 1931-1996
 LONG TERM AVERAGE VS LA NINA AND EL NINO AVERAGE
 JAN-FEB PERIOD, MARCH-APRIL-MAY PERIOD

REGION/ STATION	LONG TERM AVERAGE		LA NINA AVERAGE		EL NINO AVERAGE		% OF LNG TRM AVE			
	JAN-FEB	MA-MY	JN-FEB	MA-MY	JN-FEB	MA-MY	LA NINA JAN MAR FEB MAY	EL NINO JAN MAR FEB MAY		
DOLORES-ANIMAS-SAN JUAN										
Dolores	3.33	4.70	3.15	3.84	2.90	5.58	95	82	87	119
Durango	3.08	3.97	3.32	2.97	2.44	3.55	108	75	79	089
Ft. Lewis	2.96	4.04	2.37	2.41	2.62	4.05	80	60	89	100
Ignacio	2.28	3.17	2.48	2.75	1.95	2.91	109	87	86	092
Rico	4.62	6.43	4.76	4.73	4.04	5.64	103	75	87	088
Vallecieto	4.30	5.61	4.27	4.64	3.34	5.82	99	60	78	104
Pagosa Spr	3.07	4.09	3.50	3.21	2.50	4.75	114	78	81	116

Region 101 74 84 101

GUNNISON DRAINAGE

Crested Bu	5.00	5.58	6.66	5.28	3.82	5.27	133	95	76	094
Delta	0.89	1.81	0.90	1.38	0.77	1.90	101	76	87	105
Gunnison	1.68	2.23	2.18	2.09	1.35	1.98	130	94	80	089
Lake City	1.52	3.12	1.62	2.73	1.29	2.96	107	88	85	095
Montrose	1.04	2.38	1.16	1.55	0.82	2.46	112	65	79	103
Collbran	1.96	4.18	2.06	1.76	1.99	4.73	105	42	102	113

Region 115 77 85 100

COLORADO DRAINAGE

Aspen	3.50	5.35	4.02	5.14	2.28	3.99	115	96	65	075
Grnd Junc	1.19	2.42	1.54	1.98	1.09	2.32	129	82	92	096
Dillon	2.32	4.68	2.74	4.43	1.92	4.72	118	95	83	101
Glenwd Spr	3.18	4.67	3.87	3.34	3.07	4.95	122	72	97	106
Winter Prk	4.30	8.41	4.78	9.19	3.06	7.76	111	109	-71	092

Region 119 91 82 094

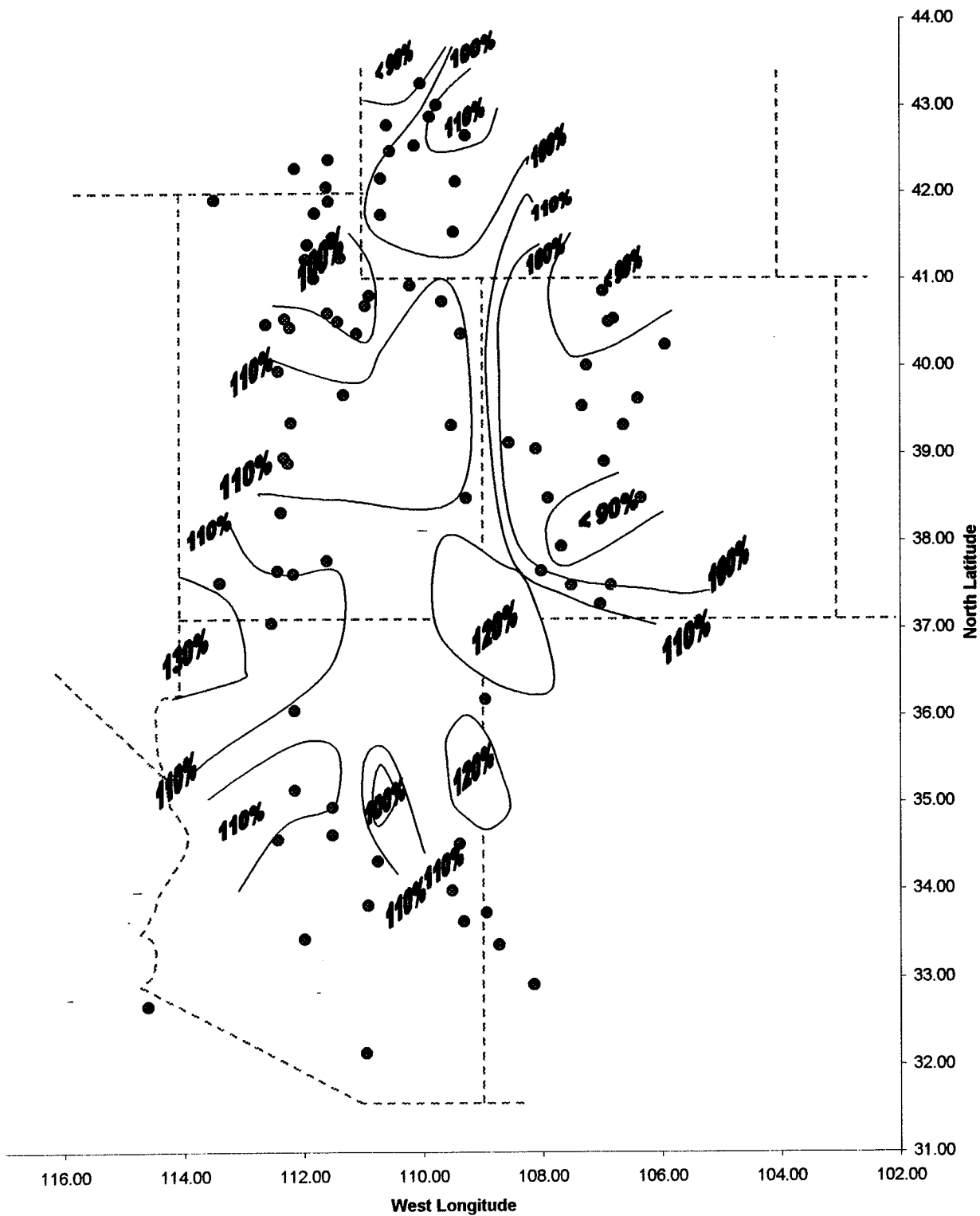
YAMPA/WHITE DRAINAGE

Craig	1.89	3.91	2.47	3.00	1.53	3.58	131	77	81	092
Hayden	2.57	4.28	3.62	3.73	1.90	4.06	141	87	74	095
Stmbt Spr	4.64	6.61	5.91	6.77	3.97	6.75	127	102	86	102
Yampa	2.27	4.06	2.83	4.33	1.55	3.56	125	107	68	088
Marvine	4.16	6.05	4.38	5.70	2.98	5.91	105	94	72	098

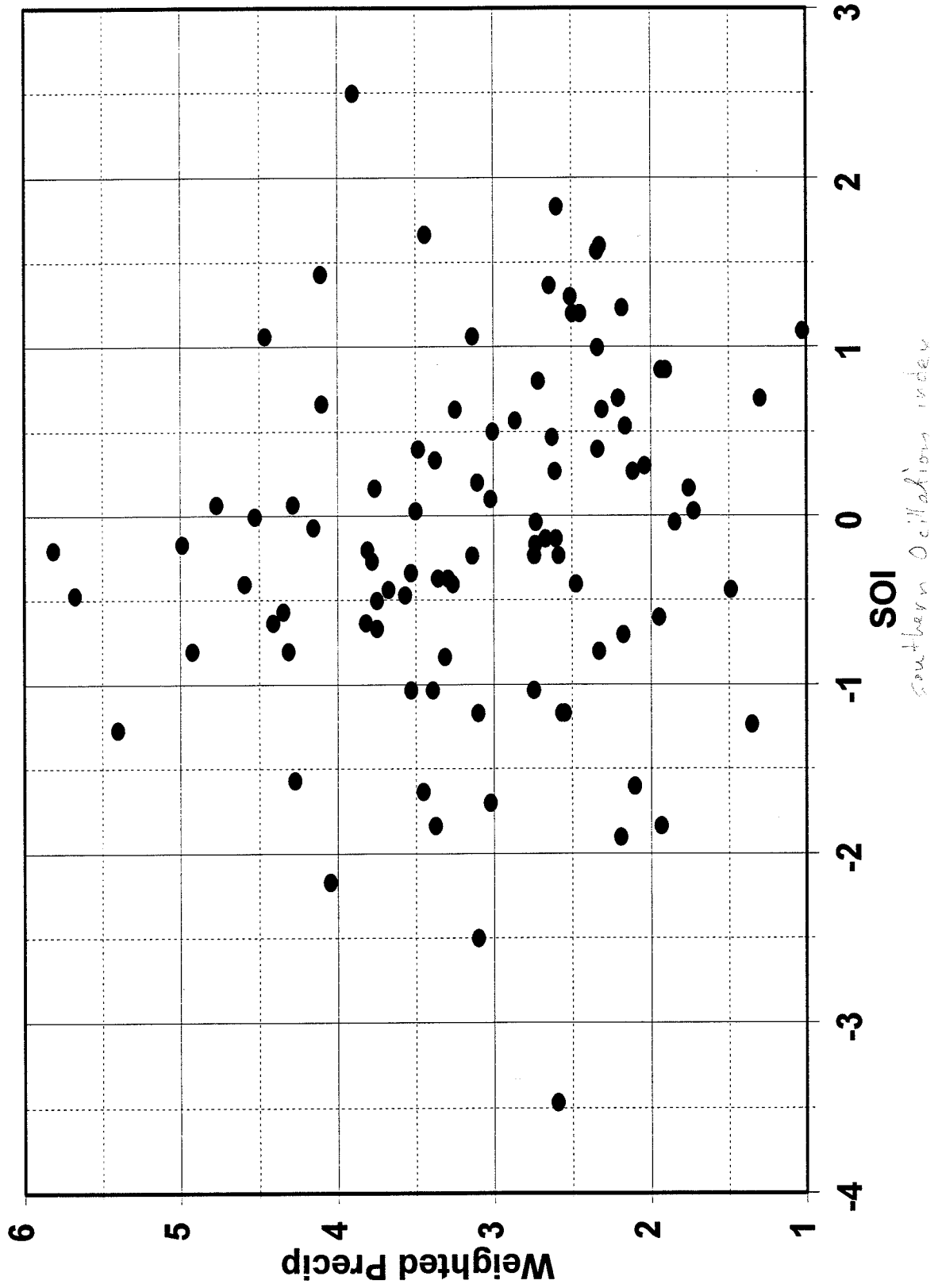
Region 126 93 76 095

NOTE: YEARS WITH MISSING DATA WERE NOT USED IN THE CALCULATIONS
 NOTE: 2ND YEAR OF EL NINO AND LA NINA EVENTS
 BOB ADAMS
 3/3/98

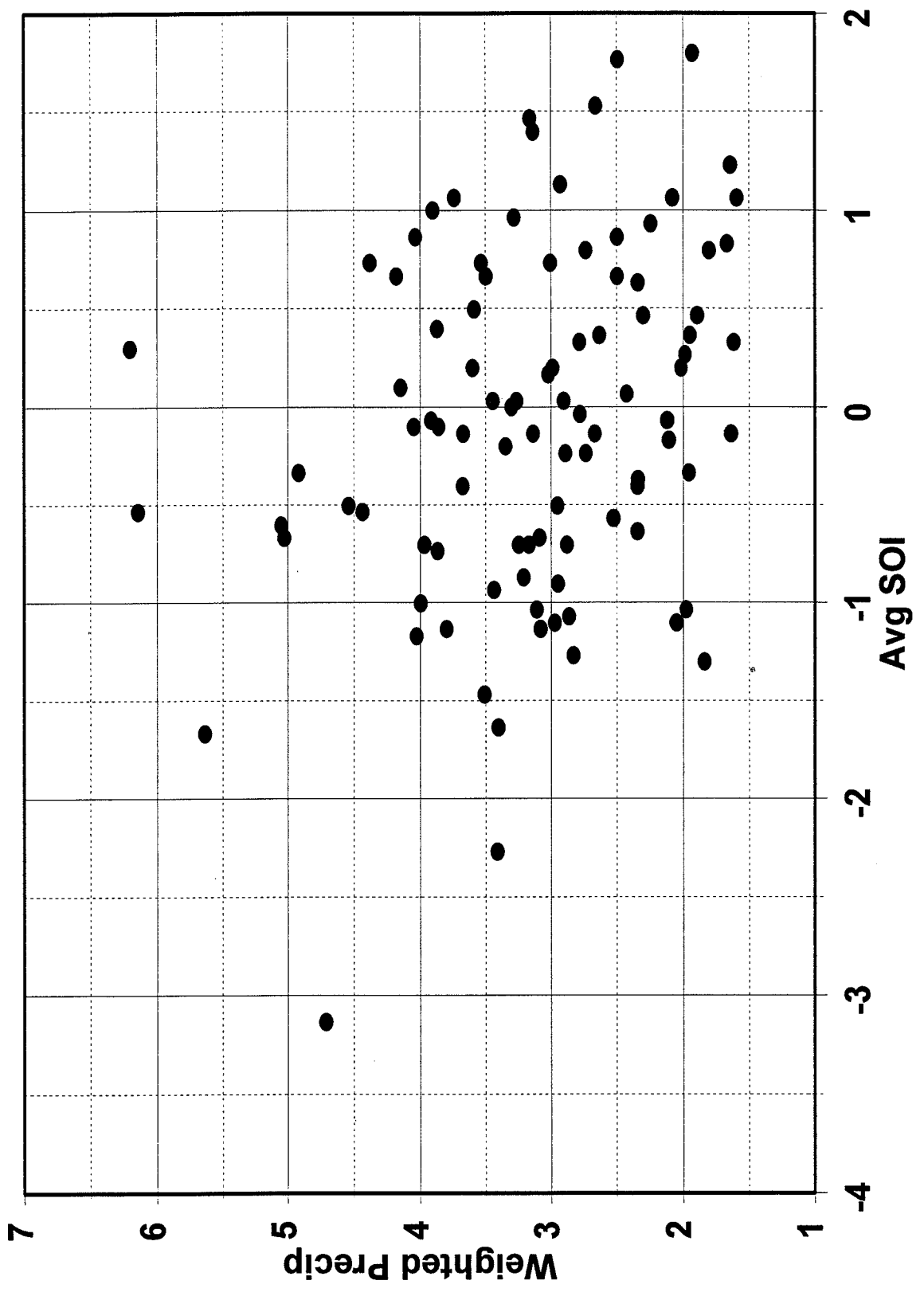
Figure A - 'El Nino' Mar-May Precipitation Pattern



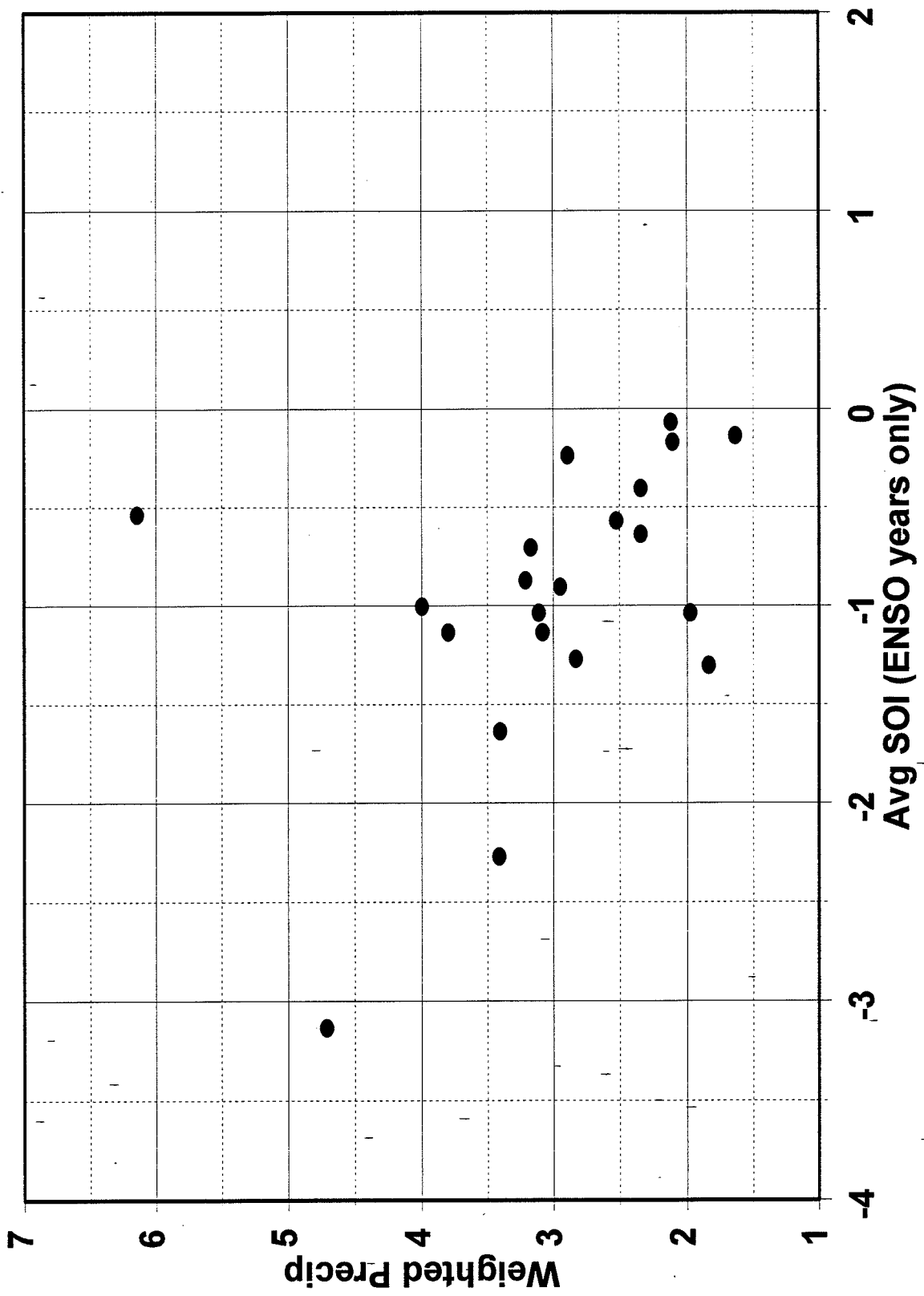
May - Jul Precip vs May - Jul SOI



Apr - Jun Precip vs Dec - Feb Avg. SOI



Apr - Jun Precip vs Dec - Feb Avg. SOI



EL NIÑO SOUTHERN OSCILLATION
(ENSO)

INFORMATION

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WEB SITE

<http://darwin.bio.uci.edu/~sustain/ENSO.html>