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COLORADO DIVISION OF WATER RESOURCES
DIVISION 6

IRRIGATION CONSUMPTIVE USE AND RESERVOIR EVAPORATION DATA COLLECTION PROGRAM - 1993
Revised August, 1994

Division VI personnel participate in a consumptive use data collection program initiated in 1978 by Energy Fuels Corporation. A site on Trout Creek contains instrumentation to collect evapotranspiration, evaporation, temperature and precipitation data. Evaporation and other weather data are also collected at Walden and at a third evaporation station in Browns Park, operated by the U.S. Fish and Wildlife Service.

The evaporation data is used to estimate evaporation losses from reservoir surfaces. The three stations are located at elevations of between 5300 and 8100 feet and sample three distinct climate zones. The evaporation pans are operated only during the ice-free seasons in their respective areas. Water level readings are taken on the pans weekly and the pans are refilled as deemed necessary by the observer.

The lysimeters were moved approximately two miles west from Trout Creek to a site on Middle Creek in May 1993. The lysimeter tanks contain approximately twelve inches of grass sod and six inches of sand. They are flooded to ground level about once a month during the growing season. The recorded volume of water used to refill the tanks is used to calculate evapotranspiration rates. Due to the new sodding effort the data for May 1993 may be suspect. The May evapotranspiration figures were not included in Table 5 or in estimates made in Table 4.

****** TABLE 1 ******

RECORDED CONSUMPTIVE USE 1993

SITE A

	Precipitation	Lysimeter Water Use In Inches South Tank	Lysimeter Water Use In Inches North Tank
MAY(13-31)	.92	3.59	3.50
JUNE	1.29	3.25	3.27
JULY	.36	5.65	5.77
AUGUST	1.03	3.11	3.19
SEPTEMBER	1.65	1.01	1.37
OCTOBER (1-19)	2.79	.07	.45
TOTALS:	8.04	16.68	17.55

****** TABLE 2 ******

SITE A

	Gross ET in Inches South Tank	Gross ET in Inches North Tank	Gross ET in Inches Average of Tanks
MAY(13-31)	4.51	4.42	4.46
JUNE	4.54	4.56	4.55
JULY	6.01	6.13	6.07
AUGUST	4.14	4.22	4.18
SEPTEMBER	2.66	3.02	2.84
OCTOBER(1-19)	2.86	3.24	3.05
TOTALS:	24.72	25.59	25.15

****** TABLE 3 ******

PARAMETERS RELATED TO IRRIGATION REQUIREMENTS 1993

Month	Mean Temp(F)	Precip (Inches)	Daylite Hours	% Month	(Kp) Blaney-Criddle Crop Coefficient	Average Gross ET (In) Both Tanks	Inches Effective Precip	Irrigation Requirement
MAY(13-31)	52.81	.92	10.06	61	1.37	4.46	.82	6.42
JUNE	53.27	1.29	10.15	100	.84	4.55	.98	3.54
JULY	57.18	.36	10.27	100	1.03	6.07	.27	5.75
AUGUST	56.68	1.03	9.58	100	.77	4.18	.77	3.39
SEPTEMBER	49.82	1.65	8.39	100	.68	2.84	1.12	1.72
TOTALS:		5.25				22.10	3.96	20.82

$$Kp = \frac{(\text{GROSS ET})\ (10000)}{(\text{TEMP F})\ (\%\ \text{DAYLITE})\ (\%\ \text{MONTH})}$$

****** TABLE 4 ******

MONTHLY POTENTIAL NET EVAPOTRANSPIRATION
FOR SELECTED NWS STATIONS 1993

	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT
WALDEN		3.18	3.85	5.61	4.19	2.92	
SPICER		3.31	3.95	5.63	4.76	2.45	
YAMPA		3.69	4.85	6.01	4.14	3.27	.98
STEAMBOAT		2.97	3.91	5.78	4.52	2.19	0.0
HAYDEN		3.57	4.54	6.08	5.03	3.26	.57
CRAIG	.29	3.59	5.35	5.99	4.84	2.83	.41
MAYBELL	1.07	3.72	5.69	6.07	5.86	3.66	.78
BROWNS PARK	1.76	3.25	5.35	5.89	5.35	3.57	1.26
MARVINE		3.07	3.28	5.48	4.26	2.24	
RANGELY	1.54	3.78	6.21	7.00	5.57	4.37	1.21
CYCC		3.84	4.25	5.70	4.48	2.42	
MEEKER	.45	2.97	5.04	6.48	4.95	3.87	1.13

These figures represent the total predicted evapotranspiration less the effective precipitation for each month. This table is produced by using Blaney_Criddle methology as described in SCS Technical Release 21 with the following adjustments for crop coefficients: Ka= Average seasonal crop coefficient. Ka= .91 (1.01 for Spicer and Walden). Kp= Monthly crop coefficient. Kp= Ka + .28 cos [19 (month - 7)] - .13. (All % daylite hours @ 40 N. Lat).

****** TABLE 5 ******

DIVISION 6 LYSIMETER PROGRAM
MONTHLY BLANEY - CRIDDLE CROP COEFFICIENT SUMMARY

	MAY	JUNE	JULY	AUG	SEPT	OCT
1979 (EF Data)	.81	.77	1.39	1.05	.81	.74
1980 (EF Data)		1.06	.99	1.42	1.16	1.13
1983	.75	.83	.72	.89	.74	.88
1984		1.08	1.07	.98	.77	.43
1985	.83	1.09	.91	.76	.96	
1986		1.01	1.04	.73	1.03	
1987		.89	.99	.94	.79	.46
1988		.88	.85	.77	.78	
1989	.80	.89	.96	.82	.86	
1990		.73	.86	.94	.50	
1991		.86	.84	.75	.89	
1992	.61	.82	1.10	.93	.53	
1993		.84	1.03	.77	.68	
AVERAGE	.76	.90	.98	.90	.81	.73

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****** TABLE 6 ******

1993 MONTHLY PAN EVAPORATION (Inches)

	Walden (8115 ft)	Colo Yampa Coal (6670 ft)	BROWNS PARK (5354 ft)
MARCH			
APRIL	.303		.36 (28-30)
MAY	4.954	2.751 (13-31)	5.70
JUNE	7.416	5.576	7.98
JULY	9.05	8.481	9.64
AUGUST	6.279	6.54	7.54
SEPTEMBER	4.974	5.152	5.71
OCTOBER		1.474 (1-19)	2.33 (1-27)

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****** TABLE 7 ******

1993 TEMPERATURE AND PRECIPITATION

	Walden		Colo Yampa Coal		Browns Park		Coal Creek		Hunt Creek	
	Temp	Precip	Temp	Precip	Temp	Precip	Temp	Precip	Temp	Precip
MARCH										
APRIL	34.8	1.31			42.9	1.24				
MAY	45.6	1.23	52.81	.92	53.9	1.87				.95
JUNE	51.9	1.76	53.27	1.29	59.1	.61		1.47		1.15
JULY	55.5	.29	57.18	.36	61.5	.62		.56		.30
AUGUST	55.6	1.47	56.68	1.03	62.2	.58		2.24		.95
SEPTEMBER	47.8	1.20	49.82	1.65	54.7	.53		1.64		1.40
OCTOBER	37.5	1.12	41.16	2.79	47.0	1.85				1.20

****** TABLE 8 ******

1993 RESERVOIR EVAPORATION (Net Depletion In Inches)

Gross Evaporation Less Effective Precipitation

	EVEV	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	TOTAL
WALDEN RES	8060		2.39	3.65	6.08	3.07	2.42	(1.5)	19.11
MEADOW CK RES	8540		2.03	3.23	5.83	2.66	2.05	(1.5)	17.30
YAMCOLO RES	9500		0.0	2.29	5.09	2.36	1.98		11.72
LAKE CATAMOUNT	6900		.03	2.20	5.62	3.56	1.78	(.75)	13.94
STEAMBOAT LAKE	8030		0.0	2.23	5.58	3.57	1.81	(.5)	13.69
ELKHEAD RES	6380	(.5)	.98	4.03	6.01	4.15	2.84	(1.0)	20.01
LAKE AVERY	6985	(.5)	.71	2.32	5.70	3.88	2.52	(.75)	16.38
TAYLOR DRAW RES	5315	(1.5)	2.97	5.95	7.38	5.05	4.61	.04	27.50
STAGECOACH RES	7120		0.0	1.99	5.48	3.37	1.58	(.75)	13.67

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