



State of Idaho
DEPARTMENT OF WATER RESOURCES

1301 North Orchard Street, Statehouse Mail, Boise, Idaho 83720-9000
Phone: (208) 327-7900 FAX: (208) 327-7866

CECIL D. ANDRUS
GOVERNOR

R. KEITH HIGGINSON
DIRECTOR

MEMORANDUM

TO: George Austiguy, Water Right Permit Section
FROM: Bill Ondrechen, Hydrology Section
DATE: June 10, 1993
SUBJECT: Real Time Evaporation Estimates for Mackay Reservoir

One widely accepted method of estimating reservoir evaporation uses measured Class A pan evaporation multiplied by a coefficient (usually 0.70 or 0.72). Since the evaporation pan at Mackay is no longer in operation (discontinued in 1985), another method must be used. Originally in WD-1 accounting, pan evaporation at American Falls or Aberdeen was used as an estimator for evaporation at American Falls and other reservoirs. For estimates at Palisades and Island Park, the American Falls values were adjusted downward based on pan data from those sites collected in the 60's and 70's.

Evaporation pans are fairly labor intensive and prone to error due to a number of factors. Frequent episodes of missing or invalid data led to the use of Penman reference evapotranspiration as a substitute for the pan data at American Falls. The Wright-Penman reference ET values are computed based on hourly readings of solar radiation, air temperature, relative humidity, and wind run and are widely accepted as a reliable indicator of the potential water loss that could occur to the atmosphere. These reference ET values are multiplied by an appropriate coefficient to estimate crop water use in irrigation scheduling or in the case of the accounting process, reservoir evaporation. A reference ET to reservoir evaporation coefficient of 0.86 was determined based on two seasons of overlapping data at Aberdeen. In other words, multiplying the Penman ET by 0.86 will yield the same evaporation estimate as pan evaporation multiplied by 0.70.

Applying the estimated evaporation at Aberdeen to Mackay will require a downward adjustment to reflect the cooler temperatures, less wind and higher elevation of the Mackay Reservoir site. Based on 10 years of overlapping pan evaporation records (1974-83) at Mackay and Aberdeen Experiment Station, a factor of 0.91 was derived using monthly totals at each site. The correlation between the two pans was only fair, with Aberdeen explaining about 45 to 46 percent of the variance of the Mackay data. Thus Mackay Reservoir evaporation can be estimated as 0.78 ($0.86 * 0.91$) times the Aberdeen Experiment Station ET values.

BO:cjk

Cumulative monthly pan evaporation data measured at Mackay Reservoir between 1966 and 1985

Notes:
Data listed above is pan evaporation. Pan evaporation is typically multiplied by 0.7 or 0.72 to estimate reservoir evaporation. Data obtained from the University of Idaho State Climate Center on May 6, 2003.