The ASCE Standardized

Reference Evapotranspiration Equation

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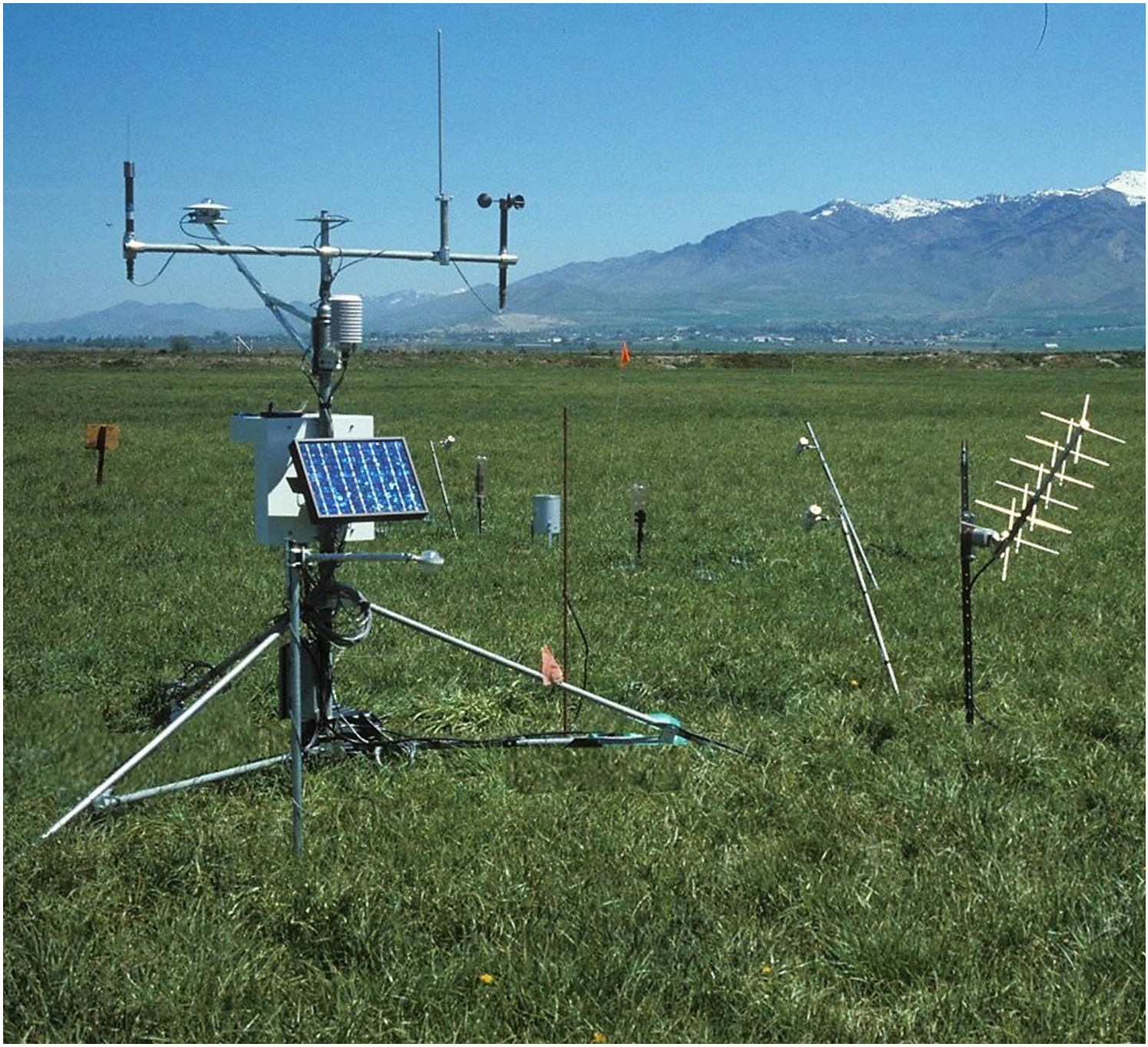

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EWRI ASCE ENVIRONMENTAL & WATER RESOURCES INSTITUTE

THE ASCE STANDARDIZED REFERENCE EVAPOTRANSPIRATION EQUATION

PREPARED BY

Task Committee on Standardization of Reference Evapotranspiration of
the Environmental and Water Resources Institute of
the American Society of Civil Engineers

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Task Committee on Standardization of Reference Evapotranspiration

PREFACE

The concept of reference evapotranspiration (ET) was developed in the 1970's as a practical and definable replacement for the term potential ET. Reference ET is a function of local weather, represents the ET from a defined vegetated surface, and serves as an evaporative index by which engineers, hydrologists, water managers and other technical professionals can predict ET for a range of vegetation and surface conditions by applying "crop" coefficients for agricultural or landscaped areas. During the past decade, for convenience and reproducibility, the reference surface has been expressed as a hypothetical surface having specific characteristics. In the context of this standardization, reference evapotranspiration is defined as the ET rate from a uniform surface of dense, actively growing vegetation having specified height and surface resistance, not short of soil water, and representing an expanse of at least 100 m of the same or similar vegetation. The EWRI Task Committee concluded that two standardized surfaces were needed to serve the needs of the agricultural and landscape communities and to provide for continuity with past reference ET usage. The ASCE Penman-Monteith (ASCE-PM) equation of ASCE Manual 70 is used to represent the standardized surface and is applied for two types of surfaces (short and tall)-- clipped, cool-season grass and alfalfa.

This recommended standardization follows commonly used procedures for calculating vapor pressure terms, net radiation, and soil heat flux. The standardization represents reference ET for each of the reference surfaces using a single equation having fixed constants and standardized computational procedures. The computational procedures are relatively simple to apply, are understandable, are

supported by existing and historical data, are technically defensible, and are accepted by science and engineering communities. The Task Committee recognizes that the standardized reference equation, with fixed coefficients defining vegetation and surface conditions, may not correspond precisely with local measurements of ET from surfaces similar to the clipped, cool-season grass and full-cover alfalfa definitions. However, the Task Committee encourages the use of the standardized equation and procedure when possible to represent reference ET for the establishment of reproducible and universally transferable ET estimates, climatic description, and derived crop and landscape coefficients. The standardized equation has been investigated over a wide range of locations and climates across the United States and has the Task Committee's confidence for use as a standardized index of evapotranspirative demand.

Some of the computational procedures of the standardized reference method, for example, the computation of net radiation, may be updated by EWRI from time to time in the future, as developments and improvements in generalized computational techniques are made.

The development of this standardization report by EWRI was made at the request of, and has been endorsed by, the Irrigation Association.

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES