

EFFECTS OF PRECIPITATION ENHANCEMENT ON THE HYDROLOGIC
CYCLE FOR THREE KANSAS WATERSHEDS

by

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INTRODUCTION

Man's desires to control the weather have existed through the ages. In recent years there have been breakthroughs in the understanding of climatic processes and technological development designed to alter the naturally occurring weather events. Whether technology for weather modification at present produces significant or predictable alterations of the naturally occurring phenomenon remains a scientific uncertainty and controversy. The potential for weather control today is, however, within the realm of feasibility and thus the potential effects of weather modification on the economy and the environment gain importance. Possible outcomes of precipitation enhancement on the hydrology of Kansas are investigated in this report.

The term weather modification is rather vague. One definition for clarity is "the object of weather and climate modification is concerned with any artificially produced changes in the composition, behavior, or dynamics of the atmosphere. Such changes may be deliberate or inadvertent, they may be transient or permanent, and they may be manifested on any scale from the microclimate of plants to the macrodynamics of the worldwide atmospheric circulation" (31, p.1).

Deliberate weather modification efforts can increase or decrease precipitation, suppress hail, dissipate fog, mitigate hurricanes, prevent frost, and alter the radiation balance. The objective of weather and climatic control is "to produce deliberate beneficial changes in the environment and to bring under control, or avert, changes damaging to society" (31, p.2). The levelling of natural variations in climatic conditions could increase productivity and reduce the failure risk of the

affected area. To be free of the consequences of a regional crop failure in important production areas, such as the recent Soviet wheat crop failure, is a dream of all mankind. The potential benefits of controlling severe storms are incalculable. Man's ability to initiate these changes is still limited and uncertain, but the potentialities offer incentive for continued research.

HISTORY

The hydrologic cycle involves many complex variables whose interrelations may never be completely understood. The role of precipitation as we accept it today was first recognized by Marcus Vitruvius Pollio in 1000 B.C. However it was not until Leonardo de Vinci (1452-1519) that the modern view of the hydrologic cycle was developed (14). In the prescientific era of weather modification, it was thought that rain could be controlled by great noises, explosions, and great fires (4). The weather control was basically superstitious, involving ringing of church bells, ceremonial dances or rituals, or periodic cannon fire to ward off evil spirits, appease rain gods or drive away violent rain and hail storms. Gradually, scientific investigation has resulted in improved understanding of weather phenomena, although even today our understanding is limited.

In 1819, the United States Surgeon General of the Army started a program to measure precipitation. The records are currently being kept by the National Weather Service. It was not until 1888 that the U.S. Geological Survey began systematic streamflow measurements of the Mississippi River. The establishment of a record keeping division of government is a milestone, since long continuous environmental data collections are essential in