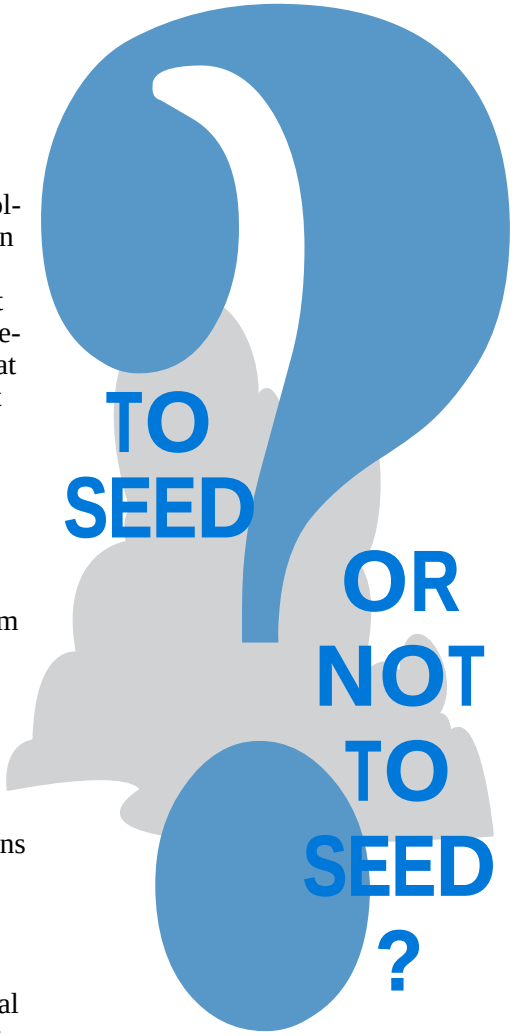
THE
ATMOSPHERIC RESERVOIR
Examining the Atmosphere and Atmospheric Resource Management



by Bruce Boe

It seems that with the increased application of cloud seeding technology the last few years in the western U.S., a lot more questions are also being asked. Near the top of the list are questions about project effectiveness. To understand the answers that are given, one must first know a bit about how the project is organized, and what kinds of evaluation are possible.

Since this is a North Dakota magazine, I'll focus on the North Dakota Cloud Modification Program (NDCMP), though most of what is said here applies to other summertime programs in the western U.S.

First, the six western counties in the NDCMP want maximum benefit from their efforts. This means that they must seed as many of the suitable clouds as time and equipment will allow.

In experimental or developmental programs, clouds may be randomly selected for treatment, and the behavior of the seeded clouds compared to that of untreated clouds. In the NDCMP, most of the clouds, at least the most favorable ones, are treated, so there is no group of untreated clouds to compare with, at least not in the target areas. So how does one know what the effects are?

The first step is to define areas near the target areas that have rain and hail climatologies very similar to those of the target. This is done by long-term historical comparisons, perhaps twenty, thirty, or more seasons' data from times when seeding was not conducted are compared.

If the climatologies are the same for both the target and control over these longer periods, one can be confident that over the long-term, differences observed during times of seeding are due to seeding. There is always some chance that somehow the climate could change in one area but not the other, but this is not likely, especially when long periods of comparisons are used. By using long periods (say four or five decades), any natural cycles will be averaged out.

The most recent evaluation of the NDCMP utilized crop-hail loss data over a sixty-five year period to estimate the hail suppression ability of the program. This evaluation found a reduction in crop-hail damage of 45 percent in target counties, compared to adjacent upwind unseeded counties. Statistical tests suggest confidence levels for this study ranging from 95.4 percent to 99.4 percent. This strongly suggests the observed differences are not due to chance. This study, including all raw data, was published in the *Journal of Applied Meteorology* in May of 1997, after extensive scientific critical review. Using similar techniques, wheat yields have been found to be 6 percent higher in target counties.

Are these studies the final word? No, of course not—with weather, it seems nothing is ever final. However, when all evaluations consistently point to significant positive results, confidence in those results should be relatively high.

The uncertainty, it seems, lies with the magnitude of the effects (Is there a 30 percent or a 60 percent damage reduction?), not with whether or not there is a reduction. If time is taken to examine the facts, the answer is: Seed. ■

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