

PRELIMINARY ANALYSIS OF REPORTED WEATHER MODIFICATION ACTIVITIES
IN THE U.S. FOR CY 1976 AND 1977

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INTRODUCTION

Since November 1, 1972, the National Oceanic and Atmospheric Administration (NOAA) has administered, on behalf of the Secretary of Commerce, the weather modification reporting program required by Public Law 92-205. This law covers all nonfederally-sponsored weather modification activities in the United States; Federal agencies have reported their activities to NOAA under interagency agreement since 1973. Accordingly, the reporting program provides the only central source of information on weather modification projects carried out in the United States and its territories.

This preliminary analysis of reported activities covers CY 1976 and 1977; a complete summary of the reported information will be available from NOAA by mid 1978. An earlier report, "Weather Modification Activities for CY 1975" was published by NOAA in June 1976, and is available from the author.

DATA COLLECTION

The reporting procedures involve the submittal of Initial, Interim, and Final Reports covering weather modification activities for individual target areas. Interim Reports are required for those projects active on January 1 of each year. A project may be carried out intermittently at one location for one or more years, or a project may begin and end within a year. Often, projects are completed early in a year and restarted near the end of that year at the same location with the same techniques. In this case, only one project at the one location would be used in summarizing the number of projects for the calendar year.

PRELIMINARY DATA ANALYSIS

The available data in the NOAA files on reported activities for CY 1976 and 1977 have been analyzed. Table 1 indicates an increase of 44 percent in the number of distinct weather modification activities from Cy 1976 to CY 1977. The number of Federal projects decreased by 33 percent; but the number of nonfederal operations increased by about 60 percent. During the period, the number of non-federal operators (weather modifiers) remained constant, but there was an increase of about 40 percent in the number of community groups sponsoring activities. A further breakdown of the operators for CY 1977 shows that 6 commercial firms

TABLE 1
Operators and Sponsors of Weather Modification
Activities in the U.S.

	CY 1976	CY 1977
Total Activities/Locations	61	88
Nonfederal	52	82
Federal	9	6
Operators	31	29
Federal	4	2
Nonfederal	27	27
Commercial	16	16
Water districts	7	7
Universities	2	2
Community associations	1	1
Utilities	1	1
Sponsors	59	68
Community associations	18	25
Airlines	10	10
Municipal districts	10	12
Federal organizations	6	3
States	5	6
Utilities	4	3
Private	5	6
Cities	1	3

carried out 60 percent of the activities, and three of these companies operated 50 percent of the projects.

The distributions of reported activities by state and target areas are shown in Table 2. Although the number of states with projects was nearly equal in the 2 years, the total target area for CY 1977 showed an increase of nearly 60 percent over CY 1976. California led in the number of activities for both years and had the largest increase in target area. However, Utah's target area in CY 1977 was the largest for the 2 years for any state. Note that the total numbers of activities are greater than the numbers of Table 1 because several projects crossed state boundaries.

The purpose and the seeding agent for the various weather modification activities are given in Table 3. The goal of increasing precipitation (rain or snow) continued to be the major purpose of the majority of projects. In CY 1977, the number of activities devoted to hail reduction was 50 percent less than the number for the previous year. In all hail reduction activities, the purpose was also to increase the precipitation.

As in the past, the most used seeding agent was silver iodide. Of interest is the increase in the use of dry ice, not only for cold fog dispersal but also for precipitation enhancement.

Table 4 shows an increase of about 33 percent in the number of seeding days in CY 1977 over CY 1976. Substantial increases in days for purposes of precipitation augmentation are indicated for CY 1977, but decreases in days devoted to fog dispersal and research efforts are evident. The numbers of hours of seeding by aircraft and by ground-based dispensers were greater in CY 1977 when compared to CY 1976. The amounts of seeding agent given in Table 4 indicate small increases of about 20 percent in the use of silver iodide and dry ice for CY 1977, and a reduction in the use of propane and polyelectrolyte material (used exclusively for fog clearing).

CONCLUDING REMARKS

This analysis of reported weather modification activities presents an overview of the commercial and research effort in the U.S. for CY 1976 and 1977. The increased activity in CY 1977 reflects the efforts of various states, local farm groups and municipal water districts to combat or forestall drought conditions by cloud seeding. This increase may also indicate that the belief in the potential of precipitation enhancement by cloud seeding is shared by more and more governmental officials and other people most affected by water shortages.

TABLE 2
Activities and Size of Target Areas,
By State

	CY 1976		CY 1977	
	Activities	Area (sq.mi.)	Activities	Area (sq.mi.)
Alaska	2	3	3	7
California	11	11,993	20	59,403
Colorado	3	2,915	6	31,300
Delaware	1	1,000	0	0
Florida	1	4,800	0	0
Georgia	0	0	3	9,000
Idaho	1	8,600	1	600
Illinois	2	2,502	3	3,700
Iowa	2	4	1	3,600
Kansas	1	9,000	1	10,400
Louisiana	0	0	2	1,350
Maryland	1	1,100	0	000
Michigan	1	530	3	7,524
Minnesota	2	15,381	1	240
Montana	2	20,005	2	20,005
Nebraska	1	2	0	0
Nevada	1	5	7	16,326
New Hampshire	1	4	1	4
North Dakota	4	23,068	3	16,288
Oklahoma	7	6,948	2	719
Oregon	2	7,821	3	836
South Dakota	3	11,821	1	2,500
Texas	5	11,226	5	11,826
Utah	4	59,410	9	92,135
Washington	3	56	10	25,379
Wisconsin	0	0	1	1,100
Wyoming	2	196	4	1,446
	63	198,390	92	315,689

TABLE 3
Weather Modification Purpose and Agent

	CY 1976	CY 1977
Purpose		
To increase precipitation	41	76
to decrease hail	12	6
to disperse fog	11	8
for research	5	4
Agent		
silver iodide	45	74
dry ice	11	17
liquid propane	2	4
polyelectrolyte	2	1
water spray	2	0

TABLE 4
Seeding Days, Hours, Purpose and Agent

	<u>CY 1976</u>	<u>CY 1977</u>
Seeding days	1,942	2,642
Seeding hours		
Aircraft	2,247	9,836
Ground dispensers	53,758	88,973
Purpose of Activity (days)		
Rain increase	1,179	1,670
Snow increase	221	711
Hail reduction	174	179
Fog dispersal	134	109
Research	28	10
Seeding Agent Amount		
Silver iodide, Kg	1,190	1,512
Dry Ice, Kg	58,000	70,000
Polyelectrolyte, Kg	1,400	455
Liquid propane, gal.	18,000	14,263
Water gal.	21,200	--
Urea, gal.	--	225